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Editorial

VIRTUAL INSANITY

No, the title's not (just) because I'm a Jamiroquai fan – it is quite insane how much virtual reality content we've managed to cram into this month's issue.

While Rift and Vive have been available for a few months, October feels like a real beginning for virtual reality thanks to the arrival of PlayStation VR. Finally consumers have access to an affordable headset that gives them a taste of this amazing technology, one which has attracted all of our attention – and billions of dollars – over the past few years.

This issue is dedicated not only at the pioneers that have created and defined a new medium since Oculus' successful Kickstarter, but also developers who remain on the fence. Who knows? Perhaps something within these pages will inspire you to create that elusive 'killer app' for VR.

> October feels like a real beginning for virtual reality, thanks to the arrival of PlayStation VR.

One last thing. I'm sorry to say this is my final issue of *Develop*. I'm leaving shortly for pastures new, but I'd like to thank everyone I've worked with during my three years at the helm of this incredible magazine. That not only means my hard-working team – past and present – but also every games creator and tech provider I've had the privilege of meeting. The work you all do is truly inspiring.

I leave you in the hands of a new team with fresh ideas, and look forward to seeing you all out there in the ever-changing world of video games.

James Batchelor

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MUSIC TO THE EYES
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VIRTUAL REALITY IS HERE... NOW WHAT?

With PlayStation VR arriving this month, and Oculus and Vive already available, the virtual reality revolution has begun. But how can developers help shape the future of the technology?

No longer constrained to just dev kits, VR headsets are now a commercial reality.

This is the time for developers to reap the rewards of early experiments in virtual reality, but experts say the hard part is only just beginning.

"The priority right now is simple enough: show consumers just how impressive VR is and how great it can be," says Rebellion co-founder Jason Kingsley. "We've demoed to thousands of players and know you can convert even the mildly interested consumer into something of a true believer simply by giving them time with VR."

Resolution Games CEO Tommy Palm agrees: "Anyone in the world can instantly understand VR because it mimics reality and the opportunities for applications and entertainment value are endless. Even though it is possible for VR to survive as a niche, it would be an enormous waste.

"Mobile VR has the greatest potential to be affordable and hence accessible to anyone, while also being on a fast track for constant improvement and advancements. This is where we will see the most interesting developments – in the short term, at least."

UPPING YOUR GAMES

Pricing will be key. Oculus and Vive have courted criticism with their high price tags, raising the barrier for entry – especially when you consider the beefy PC required to run VR smoothly and minimise motion sickness.

"The initial uptake of hardware has been driven largely by the development fraternity, plus hardcore tech and game enthusiasts," observes Tom Gillo, VP of development at NDreams.

"Entry level hardware costs have to come down in order to address more price conscious mid-core and ultimately mainstream audiences."

As we wait for those prices to be lowered, devs are given another responsibility: honing the language of what a VR game can be. To date, most virtual reality titles have been tech demos and short 'experiences', while 'full' games are most likely in Early Access. But this needs to improve if we want VR to appeal to more people.

"Content has now become the largest bottleneck," explains Palm. "VR needs highly engaging, deep and meaningful experiences that justify the investment for consumers. Yet, currently a lot of it is very short and demo-like – that needs to change."

Gillo agrees: "We need to start providing games with more to offer than demos and hardware showcases. As developers, we need to focus on games with depth of progression and strong, repeatable mechanics that draw audiences back to their headsets time and again.

"None of us want VR headsets to become dust magnets in the back of the cupboard. As we better understand what mechanics work well in VR, we can create equally compelling and commercially successful games as we've seen on other platforms."

Left to right: VR experts Darren Jobling, Jason Kingsley, Tom Gillo and Tommy Palm

But optimism surrounding VR has been stymied somewhat by reports that the momentum is faltering. A Steam survey showed that sales of both Oculus Rift and HTC Vive have slowed, indicating that most early adopters may already have a headset. The report claimed only 0.18 per cent of Steam owners have a Vive, while 0.1 per cent own a Rift.

STAY ON TARGET

Kingsley believes this will change as more affordable devices arrive: "It's arguable those were always going to be more enthusiast-focused – partly because of their cost but also how they're positioned in the market. The picture should look very different once PlayStation VR launches."

It's crucial to remember this is a new medium still finding its feet. While some claim VR could be a game-changer as big as the iPhone, others argue we can't expect the same rapid growth.

"I'm not expecting there to be a flood in the same way smartphones quickly proliferated the phone market," says Gillo. "More likely we'll see a slow and steady increase over the next couple of years as the price trends down and the content and technology becomes increasingly compelling."

Palm adds: "VR is similar to the internet in the way that it enables a lot of things that were very hard to imagine before we got used to it to actually become a reality. New applications and ideas are dreamed up for how to use VR to solve common issues daily. VCs and consumers want to see this turned into unique and engaging content. We as content creators can deliver this."

Venture Capital firms and other investors have already poured billions into VR projects over the past few years, with games developers even attracting the attentions of big name brands from other sectors. Racing studio Eutechnyx, for example, was able to spin out an entire business – Zerolight – that works with car manufacturers on virtual reality showrooms.

"The VR content marketplace is growing and seeing a lot of potential investment for short-term, single-use commissions alongside more fruitful, scalable contracts," says ZeroLight CEO Darren Jobling.

> **When you're inside an industry, it's easy to forget most people have no idea what VR is.**
>
> *Tom Gillo, NDreams*

"We frequently receive unrelated requests for branded VR experiences, from bars of chocolate to spacecraft. You just need to be focused on what you want to achieve.

"Unbelievably, VR investment hype in Europe is just building when compared to other international markets. However, there's currently no consistent correlation between company valuations and the size of the 'real' VR market. Investors look for a specific ROI that justifies the amount of risk. If they can't clearly identify their projected return, then they are unlikely to release funds for future projects."

Gillo also doubts that investment in VR is in danger of drying up: "My grandfather always told me to invest in an expanding market. I think virtual reality will see more expansion in the next three years than we've seen so far. That said, investors will want to see positive results over the course of the next 18 months if they're going to continue supporting VR."

THE FUTURE OF VR

VR interest from other sectors presents great opportunities for devs. Since our industry is the driving force behind the tech, ours are the skills that will be most highly sought.

But Kingsley is more skeptical, describing 360-degree videos and movies as "VR lite" given the user's lack of control: "It's another way of showing high production value linear entertainment. 'True' VR requires a synthetic real-time generated environment to allow the user to move where they want to."

Gillo argues that non-gaming ventures are actually more likely to be the much-needed 'killer app' for VR, adding that he doubts it will be a game that drives mainstream adoption.

Regardless of whether or not it proves to be the key to VR going mainstream, there's no doubt that the games industry will be instrumental in it evolution.

"Virtual reality has to continue to mature and innovate," says Gillo. "Pupil tracking, biometric sensors, and haptic devices. Better social integration and functionality. Improved peripheral devices, such as 3D cameras that enable people to self-publish 3D content more easily. These are all areas that I imagine will mature quickly and provide devs with new areas for exploration.

"When you're inside an industry, it's easy to forget that the vast majority of people actually have no idea what VR is. [Steven Spielberg's] *Ready Player One* movie is exactly the kind of cultural touch-paper that can re-ignite VR and take it from being a technological curiosity to a full-on pop culture and social platform revolution. I can't wait to see people's reactions when they get to virtually hang out in the OASIS."

Palm concludes: "Virtual reality is the reason we all got into games from the beginning. We saw that games would only get better and better until one day you would be the star of your own Hollywood blockbuster adventure – truly 'living' the game like never before. That day has never been closer than it is now." ■

AT A GLANCE

OCTOBER 13TH

PlayStation VR

Sony's virtual reality device and a boatload of games finally hit shelves.

October 14th

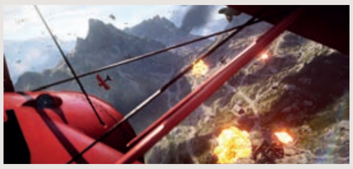
Inferno

More running around historical locations with Tom Hanks.

OCTOBER 21ST

International Day of the Nacho

Marking the death of Ignacio Anaya, creator of the Nacho. Apparently.



OCTOBER 21ST

Battlefield 1

EA DICE takes gamers back to The Great War. A more explodey version.

OCTOBER 30TH

Daylight Saving Time ends

Turn your central heating back on. Summer is officially over.

OCTOBER 31ST

Halloween

Stock up on sweeties for adorable trick-or-treaters – then keep them.

DIARY DATES

PARIS GAMES WEEK

October 27th to 31st

Paris, France

www.parisgamesweek.com

OCTOBER

Play Expo Manchester
October 8th to 9th
Manchester, UK
www.playexpomanchester.com

Games Media Awards
October 11th
London, UK
www.gamesmediaawards.com

White Nights
October 11th to 12th
Moscow, Russia
www.wnconf.com

IndieCade Festival
October 14th to 15th
Los Angeles, California
www.indiecade.com/2016

Apps World
October 19th to 20th
London, UK
tmt.knect365.com/apps-world

Sweden Game Conference
October 20th to 23rd
Skövde, Sweden
www.swedengamearena.com

Game Industry Conference
October 21st to 23rd
Poznan, Poland
www.gic.gd

GoGames360
October 28th to 30th
Austin, Texas
www.gogames360.com

EVENT SPOTLIGHT

ESPORTS INDUSTRY AWARDS 2016

Where: The Brewery, London
When: Monday, November 21st
What: Hosted by games industry commentator and presenter Julia Hardy and the Gadget Show's Jason Bradbury, over 600 of the industry's leading figures will gather to celebrate achievements and network with each other – and the event will be streamed to the world live on the night.
www.esportsindustryawards.com

COMING SOON

DEVELOP #177

NOVEMBER 2016: THE MO-CAP ISSUE

Characters in games have never looked better, with more realistic animation than ever before. We speak to the performance-capture firms leading the technical revolution, as well as the modelling and animation tools and techniques used to bring the characters to life.

DEVELOP #178

DEC 2016/JAN 2017: THE RECRUITMENT ISSUE

Our annual look at the games jobs market explores the opportunities for both new developers and established professionals looking for a new challenge. Also includes Develop Jobs Extra, our special supplement profiling studios from around the world and their hiring needs.

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PUSHING VR TO GROW WILL ACTUALLY SLOW IT DOWN

Stephanie Llamas explains why patience is needed to take virtual reality forward

When a Kickstarter campaign for an obscure virtual reality company turned into a $2bn acquisition by Facebook, people wondered how the dreams of sci-fi writers could be worth so much.

It wasn't until Google, Samsung, HTC and Sony joined in that potential stakeholders started to see legitimacy in the platform. Andreessen Horowitz said Oculus Rift would be as big as the iPhone, and market analysts began throwing around revenue forecasts upwards of $160bn by 2020. SuperData predicts virtual and augmented reality combined will reach $70bn by then.

The media still loses faith in VR when the industry goes quiet and then celebrates its potential when something juicy breaks. VR also competes with augmented reality, despite the two platforms' symbiotic relationship. But the biggest issue VR has yet to overcome is giving people an experience that leads to understanding.

HTC, Oculus and Sony are making their devices available for demos at brick-and-mortar stores. Gear VR's accessible price point and smartphone compatibility have likewise opened VR up to the public. But both require proactiveness on the part of the consumer: you have to want to try it.

So getting it into the mainstream remains its biggest challenge. It is the main reason why AR has been able to attract a wider audience.

REACHING THE PEOPLE

The industry is scrambling to find the sweet spot where VR will reach beyond privileged audiences. The best methodology we have to forecast it is monitoring major developments in the market, which seem to happen every 10 minutes, coupled with using media history as our guide.

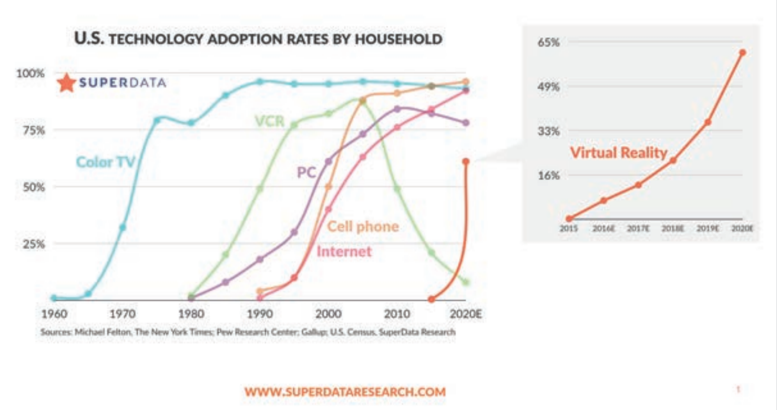
As you can see from the top graph, colour TV was unable at first to replace black and white TVs because of prohibitive pricing and lack of necessity. In the mid-50's, almost nothing on TV was in colour, and with a lack of content came lack of demand.

However, once television networks understood how prolific it would be, they began rolling out major content in colour. More affordable sets moved into retailers and their store windows, allowing passersby to experience it first-hand. By the early '70s, more than 75 per cent of American homes had a colour TV, and now it's an oddity to have a black and white TV at all.

> **High forecasts will drive massive investment, which will lead to major disappointment.**
> *Stephanie Llamas*

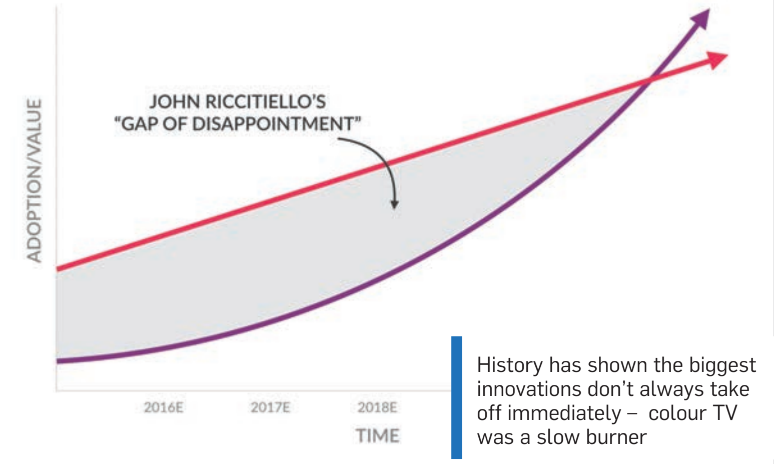
When you look at new media trends over the past 50 years you can see this slow rise, upshoot and stagnation with almost every major device. VR is currently in the slow-rise stage, what Unity CEO John Riccitiello calls the "gap of disappointment".

He argues that in the short term VR cannot meet the market's expectations, but will surpass them in the long term. Many journalists, investors and analysts are looking at VR as gold to be mined, but we aren't looking at it as a gadget, which is how it's often talked about. It has the ability to create both many-to-many and one-to-many communication channels, and to look at it simply as a cool new device is an injustice to its potential to advance humanity.



Sources: Michael Felton, The New York Times; Pew Research Center; Gallup; U.S. Census, SuperData Research

WWW.SUPERDATARESEARCH.COM



History has shown the biggest innovations don't always take off immediately – colour TV was a slow burner

VR will grow but we can't force it to go faster. Astronomical forecasts will drive massive investment, which will lead to major disappointment, slowing rather than accelerating growth. We have to trust in the process, and that's a hard thing to do when billions of dollars are riding on its success.

This doesn't mean VR won't overcome obstacle of awareness – on the contrary, the more mainstream content that's released, the more it will pique people's curiosity. What once was relegated to the gaming audience has now breached into entertainment, enterprise and education. When major brands announce their belief in the medium, it brings awareness that helps other believe as well.

We're a long way from mainstream VR. The industry will have to help make people want to experience it, and only in that experience will they be able to embrace it. But we can't lose hope or momentum – and we can't force its hand. ■

Stephanie Llamas is director of research and head of VR/AR strategy at SuperData Research
www.superdataresearch.com

MEANWHILE ON DEVELOP-ONLINE.NET

From game jam to full product: The story of Sumo Digital's Snake Pass
bit.ly/2c8sVNs

It IS Rocket (League) science: Psyonix on the tech behind its car-football smash hit
bit.ly/2cbeOar

How to delay your indie game
bit.ly/2cMQZGh

WHY VR MATTERS

Shahid Ahmad on the challenge of truly conveying the power of virtual reality

Ahmad likens experiencing VR to hearing live music: almost indescribable

An array of hammers strike taut metal wires. A series of ununsually pleasant sounds are emitted. The audience bursts into rapturous applause as the last notes decay into silence.

I've described, in rather mechanical terms, the live performance of one of Chopin's Etudes. If you'd never heard piano played before, never mind so exquisitely, no amount of words could prepare you for the artistry and emotional power conveyed by a live performance. Similarly, the biggest problem faced by VR proponents is conveying what it feels like to enjoy a finely-tuned experience inside a Rift, Vive or PSVR.

Have you ever had a vivid dream? One that is so powerful that you can almost reach out and touch it when you wake up before its gossamer-like threads dissolve and reality barges in coldly? Or perhaps you're one of those rare individuals who is capable of lucid dreaming? Well, VR gives each and every one of those willing to don a headset that rare ability to lucid dream, to be in any reality we choose, and to fashion it while still conscious.

For this fashioning to work, the experience will have to be 'composed', if you will, by someone who understands the medium, or at the very least respects it. It will be some considerable time before this new medium yields a language, a grammar, a set of conventions and best practices. Right now, it's all up for grabs. It's a precious time, pregnant with potential.

> **I was at the dawn of video games and yet this period feels even more exciting, and groundbreaking.**
> *Shahid Ahmad*

The early days of a medium are often filled with naked attempts to translate old media to the new. Some might call this skeuomorphism of sorts – perhaps there is a better word for it. Early TV shows were just radio shows with a camera, for example, but look at some of the best TV shows today and you'll see just how far we've come.

We won't know what VR is capable of until the old paradigms are shed and a new form, butterfly-like, totally at home in VR and importantly, impossible anywhere else emerges in all its impactful glory.

ONCE MORE WITH FEELING

Video games have traditionally sacrificed emotional nuance for intensity. There is a danger that VR could host even greater emotional coarseness, with porn, horror and violence being given a unique and highly intimate platform in which to launch their assault on the senses.

Without wishing to judge such content, my hope is that a new medium gives us as an industry the rare opportunity of introducing more nuance, more artistry, a more graduated emotional palette that could enrich and enlarge our lives in a way that has not been possible thus far. Novels, after all, have yielded Jilly Cooper but also Gabriel Garcia Marquez.

One of the reasons I left PlayStation was because I recognised this time as pivotal. I couldn't stand by and not at least attempt to help shape the new medium in some way with my own limited contribution. If you knew there was going to be a total solar eclipse in your neighbourhood, a once in a lifetime opportunity, wouldn't you at least try to take the day off work to witness it?

Chances like these just don't come along often. There are some observers who suggest that VR could be the last medium. In its current form, that's obviously risible, but this is just the beginning. I was there at the dawn of the video games industry in the early '80s and yet this period feels even more exciting, even more groundbreaking and those of us lucky enough to be able to help define the early days have a huge burden of responsibility to future generations, not just of developers, but of players too. Will we choose the easy route or will we go for the harder, but ultimately more rewarding and enriching route? ■

Shahid Ahmad is an independent developer, and previously head of a strategic content at SCEE. You can find him on Twitter at **@shahidkamal**

How motion capture firms are driving the push for realism

bit.ly/2d2grYl

PlayFusion: 'Lightseekers is the first real toys-to-life innovation in years'

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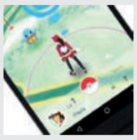

The next Pokémon Go

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BEYOND DEFINITION
Labcoat Studios ponders VR projects that don't fit in genres
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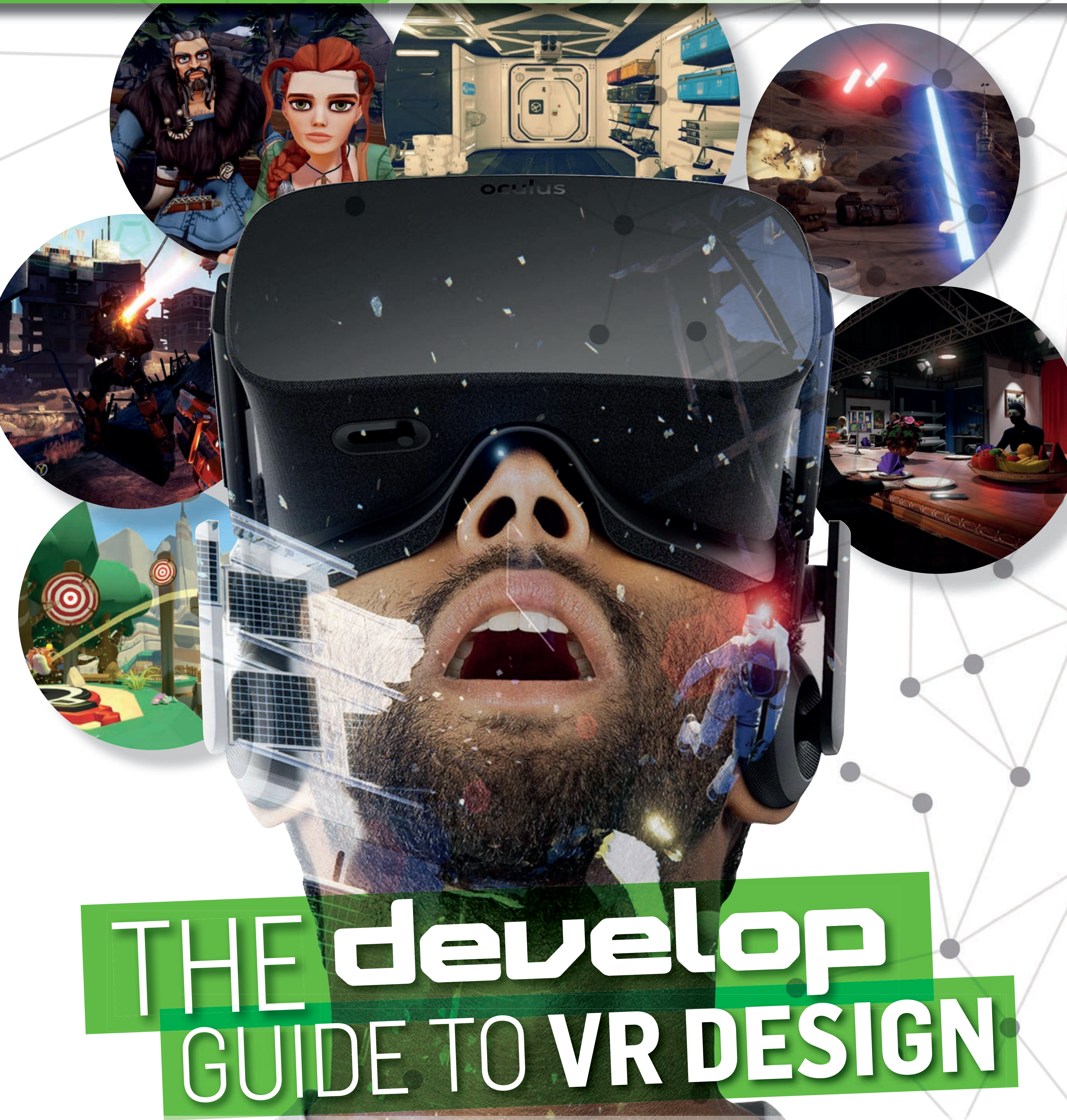


THE develop GUIDE TO VR DESIGN

Virtual reality is the most groundbreaking technology developers have got to grips with in decades, and we're still just beginning to unlock its full potential. **James Batchelor** asked VR experts about the many aspects of games development that need to be completely rethought for the new medium

Presence. Immersion. These are the words used in vain attempts to convey the experience of virtual reality to those yet to try it for themselves.

Encapsulating the two concepts in VR projects you develop is perhaps the toughest challenge games makers have ever faced – but one that countless studios around the world have embraced with gusto.

"It's a magical moment the first time you look down and see your virtual body, or reach out and see your avatar's arms in perfect sync with your own," says Andrew Willans, lead game designer on *Eve Valkyrie*, CCP's poster child for VR action games.

"You instantly feel connected to the game world in a way never before possible. It's incredibly important because the deeper this connection is, the more invested and emotionally involved you feel within the experience. It can amplify moments of wonder, or fear, or excitement because you feel present and a part of the events. You are no longer watching them unfold from a window within the real world."

But Vincent Martel, executive producer at *Fated: The Silent Oath* dev Frima Studio, warns that achieving this sensation is no easy task: "Everything in VR is so fragile. The smallest thing can break the immersion and when you're trying to generate emotions, immersion is key."

Triangular Pixels' creative developer Katie Goode agrees: "In order to keep players feeling as though their world is real, you have to allow them to interact with it in all the natural ways that humans can. As soon as players try to interact with something as they do in real life and it doesn't respond, the immersion is broken.

"The environment and objects within it don't have to be realistic, they just need to be able to respond and their behaviour be consistent to the world you have created."

Over the next seven pages, we explore the myriad of factors devs must take into account when crafting their VR experiences.

THE INITIAL IDEA

Developing for virtual reality is not something you can dive into with nought but good intentions and a winning concept. Studios should be prepared to spend a considerable amount of time prototyping their ideas – and even shunning anything, perhaps *everything* they've ever learned about games development.

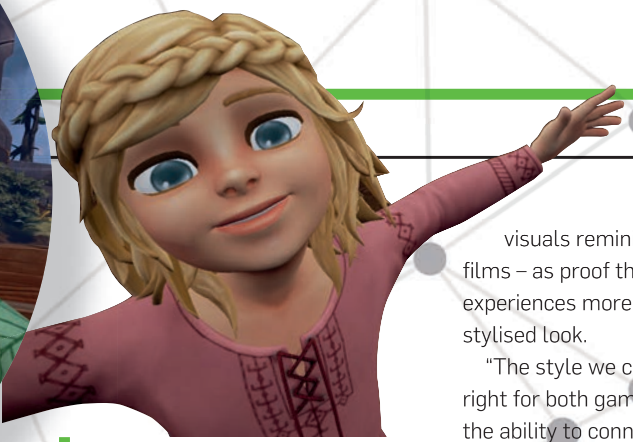
"Throw away everything you know and start over, approaching each new problem as a whole new thing," advises Adam Orth, CEO of *Adr1ft* dev Three One Zero. "It's one of the biggest things that makes VR awesome for developers. You have to constantly try new things and fail spectacularly at them – that's where the good ideas come from.

"Even the most mundane in-game action such as opening a door becomes a challenge you have to think about from a whole new perspective."

> **It's a magical moment the first time you look down and see your virtual body.**
>
> *Andrew Willans, CCP*

Goode adds: "As developers, we're also experienced gamers and can see what works and doesn't due to years of both making and playing games. When it comes to VR, no developer has that kind of experience yet. The kits haven't been out for 20-plus years with countless examples of similar gameplay to call upon.

"What this means is that we're often having to look at the limited pool of current experiences, recall how humans tend to behave in real life, and go with our guts to



Frima believes *Fated*'s cartoony art style makes it easier to emotionally engage with its characters

what seems like it will be fun. We have to always test our theories."

Peter Pashley, head of development at Ustwo Games, stresses that both prototyping and usertesting is essential to honing your VR concept because it's "impossible to tell how well a feature works without trying it on a range of other people".

"In building *Land's End*, we were constantly surprised by how our assumptions did not work as well as we expected when we tested them in VR," he says. "We also found there was a huge range of unpredictable reactions from different people. So you need to test things frequently, on device – and not just the dev team."

Willans suggests devs reign in expectations and keep their concepts high level until they're able to try them out properly in VR: "As soon as the initial idea has struck, open up an editor and place some assets in a scene that even remotely represents the one in your head. It will inform all critical choices you make and avoid the pitfalls of applying traditional design methodology to a medium with a work-in-progress rulebook."

SEEN THROUGH NEW EYES

One of the earliest considerations for VR devs will be the art style. Since the medium requires a game to be rendered twice – once for each eye – achieving realistic graphics without affecting performance is tough. But then some may argue that anything other than a realistic style defeats the purpose of VR and makes it difficult for users to believe they have been transported to another world.

Mindfield Games CEO Ville Kivistö stresses that the "art style should be chosen by the need of the product". His studio's first VR venture, sci-fi outing *Pollen*, pushes for realism and highly-detailed graphics, but his team also have a more cartoonish project in the works.

"This is because the second game's design requires a much more vibrant and casual look and feel," he says. "Immersion can be achieved with any sort of graphics, realistic or not – just as long as the rest of the experience is done well enough."

Kirill Yudintsev, creative director at *War Thunder* dev Gaijin Entertainment, adds: "Gamers' imaginations are usually very vivid and virtual reality helps to expand it even more. Realism probably gives you more empathy. You can draw a parallel between what happens in the game and what you experience or see in the real world.

"In *War Thunder* when you are in the middle of aerial battle and you can see your teammate from your cockpit, his plane on fire, about to crash at any moment – it wakes up your feelings. You remember what you've read in history books or seen in movies. That makes you empathise with him stronger than if he was just a robot or cartoon."

Willans believes there are arguments to be made for both styles, instead stressing that consistency is paramount: "If I'm in a highly stylised world, I expect that any visible parts of my avatar would match that style. I'm sure there's also a case to be made for a *Who Framed Roger Rabbit* approach to mixing media, but right now I think we're seeing great results from fully embracing the fantasy of leaving our real bodies behind."

Martel points to his own team's *Fated* – a narrative VR adventure with visuals reminiscent of animated films – as proof that you can make experiences more engaging with a stylised look.

"The style we chose proved to be right for both game performance and the ability to connect emotionally with our characters," he explains.

"Hyper-realistic characters in VR are often creepy and a lot harder to connect with. A more stylised world is also usually a lot more colourful and works surprisingly well in VR."

Pashley maintains that the current limits of the technology means there is "no such thing as realistic VR graphics".

He continues: "The mind expects much higher fidelity in VR and even the most state-of-the-art graphics engines can't deliver realism that fools the eye. Immersion doesn't require photorealism, but it does require not breaking the rules of the place in which the player thinks they are.

"A simple environment also helps with motion sickness because the player's unconscious has less detail to inform its motion detection and therefore can accept what it sees more easily."

SMOOTH RIDE

Motion sickness is, of course, the caveat to virtual reality's mighty promise. It's the demon VR devs fear

IN CONTROL

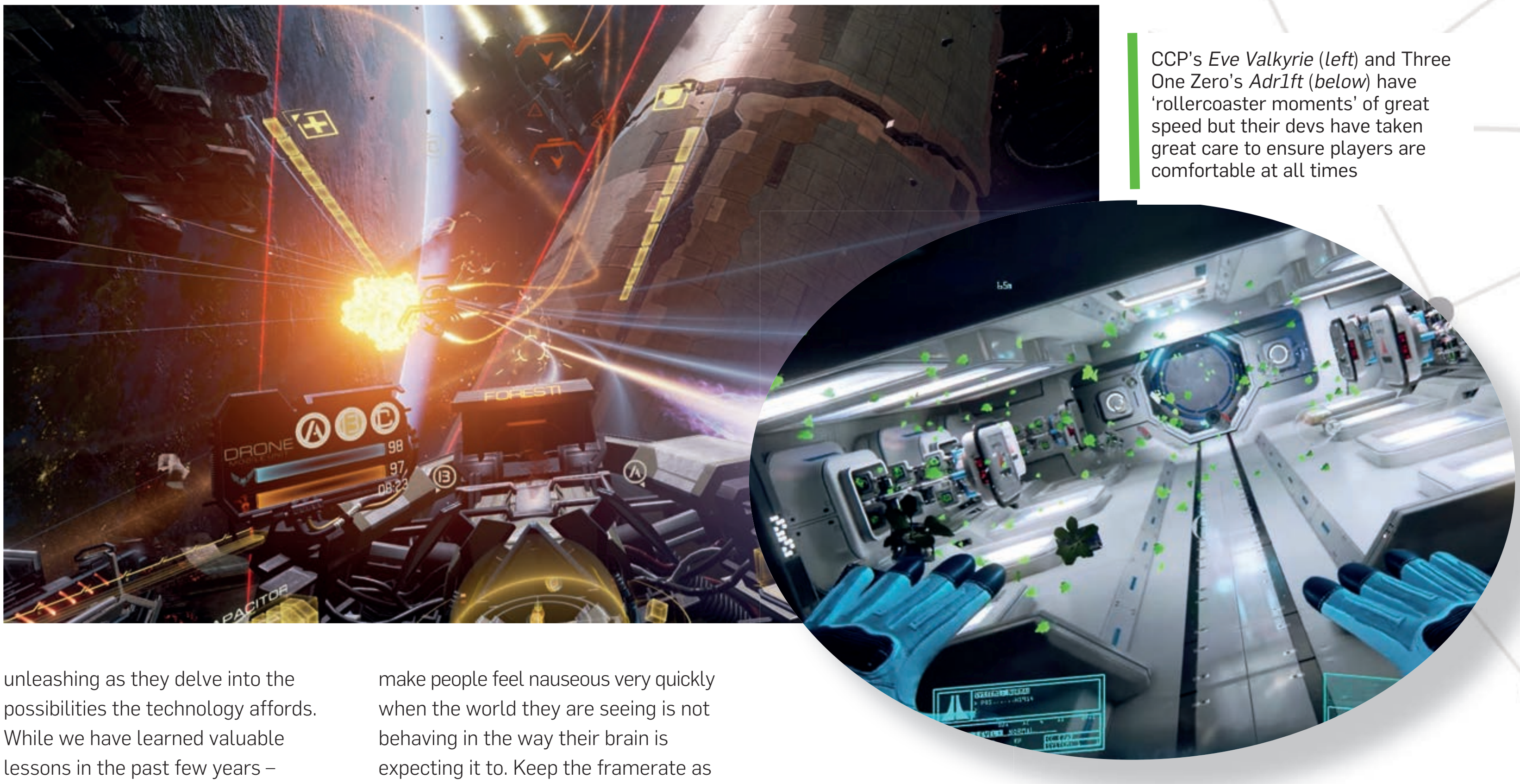
At first, VR devs relied upon the conventional gamepad but the advent of motion controllers has combined stick and buttons with one-to-one gestures. And a good thing too, as Force Field VR's Martin De Ronde says gamepads aren't as intuitive as you might think.

"Players can press buttons without having to look down whilst playing *Call of Duty*," he says. "But now they struggle in VR when they cannot see the controller. Our mantra is the fewer buttons used in VR, the better. It also adds to the immersion if you are not constantly reminded that you are holding a joypad."

Fierce Kaiju's Paul Colls adds: "Motion controls in VR are the holy grail of gaming. They allow you to reach into the worlds we create and interact with them. It gives developers more options, having a representation of your hands in the game can allow you to feel more agency within that game world. We've seen people literally slapping ammo clips into a weapon."

Goode agrees, adding that "there's no going back after hand-tracked controllers". However, the devices are only as good as the input schemes that make use of them. You also have to predict how players will expect to use them.

"As programmers and designers, we need to deal with the many different ways people pick up and use objects," she says. "Take a screwdriver as an example. If we asked players to use a powered screwdriver, they would hold it to the screw, and press a button. When we ask players to use a manual screwdriver in *Unseen Diplomacy*, we've seen players do a Wii-waggle, twist their wrists back and forth, or actually try and use it as a real screwdriver."



CCP's *Eve Valkyrie* (*left*) and Three One Zero's *Adr1ft* (*below*) have 'rollercoaster moments' of great speed but their devs have taken great care to ensure players are comfortable at all times

unleashing as they delve into the possibilities the technology affords. While we have learned valuable lessons in the past few years – maintaining a high and consistent framerate, avoiding unexpected acceleration, and so on – there is still much to learn as the games industry targets a wider demographic.

"People have a wide range of tolerances when it comes to motion," says Willans. "The most common reports of motion sickness come from passengers within vehicles, but those sensations are not reported when the same person is actually driving the vehicle. Focus of attention through direct control is a strong factor in such circumstances."

Yudintsev adds: "The reason for motion sickness in real life is that the signals your brain gets from your cerebellum do not match with what you see, like acceleration or gravitation. The same thing happens in VR.

"Focusing on the horizon or at far away objects can reduce any symptoms of motion sickness while driving a tank, an aircraft or a ship. Luckily, you always need to do that in the game."

Simon Gardner, CEO at Climax, adds that his team were often warned that a concept or mechanic would trigger motion sickness, but when they prototyped the idea they found it actually didn't affect people.

"Avoid what we call rollercoaster moments," he advises, thinking back on everything else his team has learned. "It's also critical to avoid any lag and framerate drop – this can make people feel nauseous very quickly when the world they are seeing is not behaving in the way their brain is expecting it to. Keep the framerate as high as possible, try not to drop any frames, since that will result in a worse experience and increases the chance for motion sickness."

Orth added that, providing the framerate is high enough and the player's gaze is never controlled, devs can push for that sense of inertia that truly brings players into their world.

"For *Adr1ft*, we embraced the simulation aspect of being an astronaut and fully went for it," he says. "It's akin to a rollercoaster – you expect to feel a little of that. We did a lot of work to make sure it was as comfortable as it could be, but it's not for everyone. I personally don't have any issues. I can't go on a rollercoaster in real life, though. I get very nauseous."

> **Throw away everything you know and start over. Approach each problem as a whole new thing.**
> *Adam Orth*

The danger of motion sickness goes hand in hand with movement in VR, particularly when that movement is controlled directly by the player. Since inputs are becoming wildly different to traditional games (*see 'In Control', page 13*), devs have to consider fresh approaches to movement.

Paul Colls, creative director at *Viral* dev Fierce Kaiju adds: "Traditional stick or yaw control is not well suited to VR, so new methods of traversal are required. Fortunately there are some strong examples out there. If possible, look at ways to tie the movement up in the narrative, mechanics and visuals – this will help to make the project feel more grounded and cohesive."

Force Field VR's CCO Martin De Ronde points to *Damaged Core* and *Budget Cuts* as prime examples of Colls' point. The former sees players hacking into different robots and cameras to see the world from their perspectives, while the latter uses portals in a fashion similar to *Dishonored*'s Blink move.

"Both create a contextual wrapper around the mechanic of moving around in VR without making you motion sick," he says. "Not only do they do it in a believable way, they also manage to turn the feature into an actual interesting mechanic, opening up tactics."

Meanwhile, *Land's End* by Ustwo Games shuns such rapid jumps in favour of a system in which players click on pre-set points in the environment and the camera casually wanders to the chosen destination.

"Some people think that teleportation is the only way to move around in VR, but in our experience it very quickly disorients the player and ruins their sense of place, which is key to immersion," says Pashley.

VIRTUAL WORLDS

The movement mechanic of *Land's End* is also a prime example of how developers need to design their VR environments around their traversal system. After all, there's no sense architecting incredible levels if they are difficult, perhaps nauseating, for the player to explore.

"The only way to create successful environments is to iterate their design alongside the way that you move around them," says Pashley.

"The points that you can move to in our game are pre-ordained, so it was critical to design the environment so that these points felt natural, were easy to notice, didn't feel repetitive, didn't involve uncomfortable trajectories between them, didn't take too long to get to and so on."

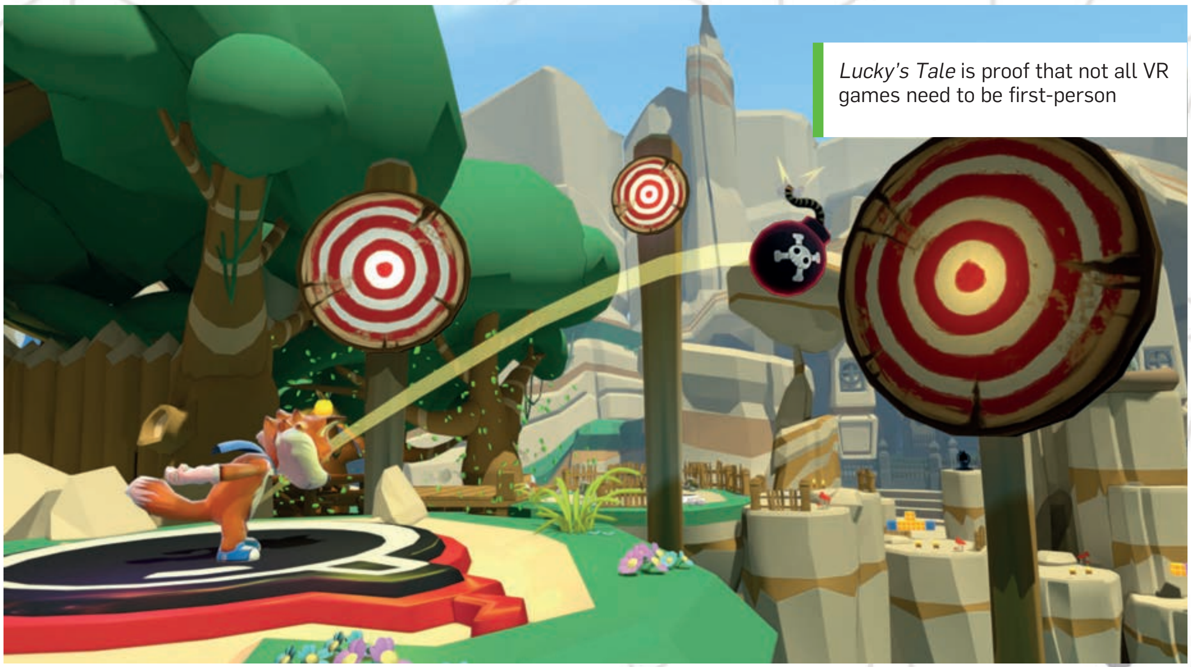
Orth adds: "Walking down a hallway and opening a door in an FPS is something developers and players know how to do. Doing that in VR is very, very different from every angle and all of that has to be considered into the overall level design. I have to reach out with my arm in the physical world to grab a virtual knob, twist it and pull the door open so I can walk though. That's a complex thing that needs to be carefully considered from many new points."

SUBTLE DIFFERENCES

Mindfield's Kivistö says his team had to redesign a level after they found a seemingly simple piece of architecture caused motion sickness.

"We had a circular staircase," he explains. "While iterating our movement, test players got nausea after walking these stairs. Quite soon we found out that players moved up the stairs too hastily or too many times up and down, doing movements that would cause nausea even in real life.

"It's just too easy to forget that in VR you're missing all the feelings of acceleration in your body. So we had to replace the circular stairs with a regular straight ones."



Lucky's Tale is proof that not all VR games need to be first-person

It's not just the grand concepts like traversal and level design that require a unique approach when it comes to developing for virtual reality. Even designing your UI and presenting basic game information clearly will be vastly different from traditional screen-based games.

> **The imaginations of gamers are usually very vivid and virtual reality helps to expand it.**
>
> *Kirill Yudintsev*

"A traditional style HUD would likely need putting into a helmet or cockpit," Colls offers by way of example.

"You can have fun with this, though. Think of ways you could build the information required into the world, on control panels, weapons or even the characters themselves."

Camera is also a crucial consideration. While the vast majority of VR games are played from a first-person perspective, that doesn't mean their development is synonymous with the first-person games of the past.

Equally, some developers are experimenting with the possibility of third-person cameras and the impact these might have in VR.

"With third-person VR games there is less control over the camera, so level design is different from traditional third-person games," explains De Ronde.

"We are currently working on two games where we have made the explicit choice to go for a static camera and build a game around that. Not all games or genres require immersion, especially third-person games. Yet they can still be introduce lots of interesting new takes on the genre as a result of VR."

Oculus has proved this with virtual reality 3D platformer *Lucky's Tale*, which controls much the way you would expect a *Mario* game to but positions players directly within the level itself, watching as Lucky leaps between platforms around them.

Gardner's team at Climax has also dabbled with this: "We've made third-person VR games with a character moving through levels using a camera to follow them.

"We've avoided having tight bends – 90-degree turns into side corridors, for example – because having a follow cam suddenly sweep around a tight bend makes people feel nauseous.

"We've had to design levels to either be far more linear with gentle curves to create a smooth follow cam experience, or have the avatar move through more open spaces where the player can easily follow their character just by looking left or right."

PHYSICAL REALITY

Virtual reality opens itself to all manner of possibilities in terms of how it gets players engaged with your games. No longer do they sit there mindlessly pressing buttons – now

VR FOR ALL

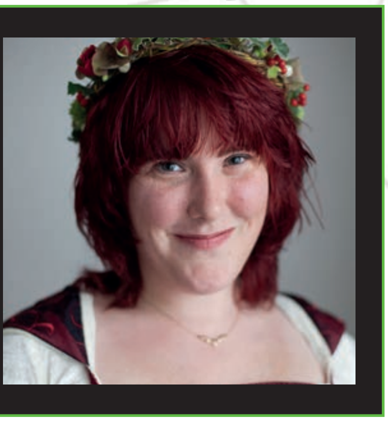
The majority of virtual reality experiences – particularly those designed for motion controllers – require physical activity from the player. But not all users will be able to duck, weave and crawl around.

Triangular Pixels' Katie Goode says despite the 'assault course' nature of *Unseen Diplomacy*, it has still been developed with accessibility in mind.

"Physically disabled users can still play the game – and this goes beyond just button remapping," she says.

"Many players cannot crawl around on the floor due to either unseen disabilities, old age or even being in a wheelchair. For those players, we had to create variants which were wheelchair-friendly, with widths of spaces being the width of a chair, having tools on a table rather than spawning on the floor, and making sure that lasers don't go too low for those players.

"This wasn't a small amount of work, and we would not have needed to do it if players were just in a cockpit, but it greatly opens up our audience."



they can physically perform in-game actions like aiming a gun, sword fighting or even opening a door.

While it's important to ensure your game is accessible (*see 'Reality for all', page 15*), devs should still feel free to experiment with how active they want players to be.

"*Unseen Diplomacy* is one of the most active VR games available, with players being asked to crawl through vents, roll under and dodge past lasers and running between points – while actually having to walk themselves around a large environment," says Goode. "Although, I can say for sure that more active games are harder to develop."

> **There's a huge range of unpredictable reactions from different people. Test things frequently.**
> *Peter Pashley*

Alternatively, the required level of immersion in your virtual world may require a more sedentary experience. Seated players will soon forget that they're sitting on a nondescript chair if they believe they're in the pilot's seat of a starfighter.

"Designing a cockpit-based game is a little easier, because the player is contained and restricted to a very specific and limited set of abilities," says Orth. "It allows you to control the experience a little more and has the ability to reduce motion sickness due to the static HUD and geometry that's always onscreen, moving with your gaze as a single object.

"This allows the player to have a visual point of focus to stick to during the experience. Unfortunately, most cockpit-based games also are built around flying something, so there's a balancing act there."

Either way, there is a potential obstacle that no non-VR developer has to concern themselves with: unpredictable player movements. In a conventional game, users may try to break the mechanics or limits of the world but will do so through a more limited, pre-set control scheme. Motion control-equipped VR users, meanwhile, can move in any direction physically available to them, and your game has to be prepared for this.

"The player can – and will – look anywhere at any time," warns Gardner. "Use camera target triggers to launch special events when the player is looking in a certain direction rather than just walking in to a trigger as they might miss something important."

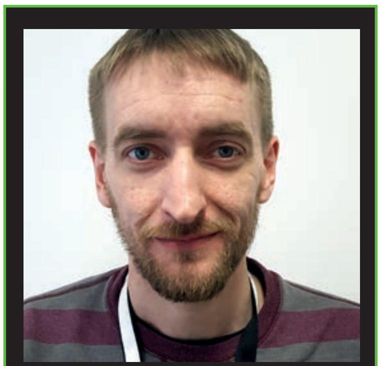
Goode advises: "Create systems, rather than scripting individual actions. Give objects properties, try to program them in a way in which seems natural in real life. Our game has big rocker switches which react to any physics collider that presses them. This means players can use a broom they find, reach through lasers, and press the switch – something we only found out watching a Let's Play video."

Herein lies another secret to achieving the level of immersion we all hope for in virtual reality: a world that reacts to you and your actions. Frima's Martel says this even extends to seemingly minor details, like eye contact with NPCs.

"You need to build a very good 'look-at' system," he explains. "You don't want characters to stare at you without blinking when you're talking to them. That would be creepy. You need 'natural' eye movement and blinking. NPCs should also be aware of your presence, or you'll feel like a ghost.

"You also need to create a lot more content. Someone can decide to look around when they should be focusing on the action right in front of them. There's a lot of stuff in *Fated* that nobody will ever see. For example, in our cart chase scene, there are very few reasons to look behind, but if you do, you see the other characters reacting to the scene.

"While it is very important to steer the player in the right direction,



TESTING VR

Testronic's head of VR testing Julian Mower shares some key learnings

We have recently concluded testing on one of our first VR titles, with it successfully passing submission for the PSVR platform on the first attempt.

During testing of both this title and other games on different HMDs, we learned some very interesting things. Firstly, when talking strictly about Functionality and Compliance testing for VR titles, the differences in how to test and what needs to be tested are minimal when compared to 'normal' games. Indeed, certain aspects of testing can become easier in VR when testers navigate a game environment by way of a camera fixed to their heads.

Audio testing is an area that is often given too little focus in QA, but with VR concepts such as attenuation, radius can be immediately perceived due to a first-person perspective.

The same is true for camera collision within a VR title, as the tester is operating with a heightened sense of awareness and will perceive risk factors much earlier. If your game dictates that the character is able to jump or crouch/crawl, then you can definitely expect testers to jump/crawl to replicate the action.

Due to the above, exploratory testing can be a more efficient method than scripted testing when it comes to VR games. Whilst the latter is still essential, the narrower remit of most VR titles allows more time per area to check all possible interactions.

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PLAY TIME

Another crucial topic of debate in VR development is how long a play session do you design for?

"For player onboarding we offer shorter, less intense scenarios," says CCP's Andrew Willans. "But our game modes range from a two-minute free roam round an asteroid field, to a 20-minute action-packed fight versus a capital ship. Some of our sessions are up to three hours. Of course, there is some downtime between battles to allow players to catch their breath."

Frima Studio's Vincent Martel says the five acts of VR adventure *Fated* weigh in at around 20 minutes each, with players able to take a break in-between. Fierce Kaiju's Paul Colls says *Viral*'s stages were designed to be small so players using the Gear VR touchpad could have a rest – but he believes they will want more.

Climax's Simon Gardner adds: "Research shows that average VR gameplay sessions are up to 45 minutes. Our first games had levels of three to four minutes as we thought that players would get fatigued quickly – but they don't.

"We're now designing games that cater for longer sessions. I think seated gameplay, with games that have a gentler pace to them – like an adventure game – are a great fit for longer VR gaming sessions. This is something we are exploring right now."

restricting actions and movement too much can also shatter the sense of presence. At some point you need to assume that the player is willing to 'roleplay' a little. Sure, they can walk away during a conversation and miss an important piece of the story, but people don't normally do that. Don't ruin the experience for everyone by locking the controls just because one person might do it."

De Ronde agrees: "Many players 'maintain' the immersion themselves. We have a game where you are on top of a tower and people could easily step off without falling, or in other areas reach their arms through the walls, but they don't. It doesn't help them and it detracts from the experience. I guess it's similar to playing a traditional RPG and constantly pressing the jump button. People don't usually do that even though they can whilst for example chatting to NPCs, cause it breaks their experience."

Kivistö adds that Mindfield made the screen fade to black everytime *Pollen* players did something the game wasn't designed for. Rather than breaking the immersion, users soon learned how to avoid triggering this.

Another unpredictable factor for developers is play space. While *Unseen Diplomacy* is designed for a specific area at events, there's no way to know how much room players have at home.

SPACE INVADERS

Colls suggests implementing alternate control schemes to account for this: "If you take a room-scale experience where you are supposed to physically walk around, how would you do that on a device that is unable to do room-scale?

"Different control options allow the players to move around that space without walking around. It also means your game can be adapted to various HMDs, reach more people and potentially make you more money."

> **Immersion can be achieved with any sort of graphics, as long as the experience is done well.**
> *Ville Kivistö*

When you think of the investments made in the medium over the past few years, it's no secret that many believe VR is the future – but it's crucial to bear the future of VR in mind. While the technology continues to amaze those experiencing it for the first time, as it becomes more widely available that initial excitement could wear off.

"In my experience, 'presence' is quite subjective," says Colls. "Experiences where I once felt 'presence' don't make me feel so in awe these days.

"Ultimately, presence is about building a convincing enough experience so that the player is fully immersed in the world that you create. Ensuring you have a slick, well crafted project will go some way in helping ensure that the illusion doesn't slip, then people are perhaps more likely to get that connection with your title."

Fortunately, there is a plethora of VR tech demos, experiences and full products – led primarily by the games industry – to learn from.

"Don't ignore what the VR community has been sharing over the past few years," urges Goode. "Take it in, evaluate it, implement it and see for yourself why we've been saying these things by testing your ideas on others. Then try to do something new."

Three One Zero's Orth concludes by reminding devs of the end goal: mainstream VR able to transport the broadest possible audience into new worlds of entertainment.

"If you want to do a big virtual reality experience where the goal is to penetrate a mass market, you may want to guide the player and treat the experience as casual rather than hardcore," he suggests.

"It's important to remember only a tiny fraction of the potential VR audience has ever even seen a HMD in person, much less tried one out. Most of these people might not be gamers either, so the interactivity has to be simple, intuitive and universal in order for anyone to grasp an interactive experience, let alone VR." ■

BOOM 100
BOOM 100

> Many VR players maintain the immersion themselves.
>
> *Martin De Ronde*

MASTERS OF REALITY

Develop speaks to Nate Mitchell, co-founder and VP of product at Oculus, about how the pioneering firm is finally making virtual reality a consumer proposition – and taking developers along for the ride

Oculus finally launched to consumers in March. Six months on, what's the reception been like?
It's been tremendous. We launched with something like 50 games, apps and experiences in the Oculus Store. We're now up to over 100. We couldn't keep up with all the demand initially – we had some manufacturing challenges, but we've resolved those.

At Gamescom, we started the international retail rollout, bringing Rift to retailers across Europe, starting with retailers in the UK, France and Germany. In October, we're going to start rolling out demos for our Touch controllers to these same stores. Later this year, we've got Touch launching with over 30 fully-featured games.

Gear VR, which we launched with Samsung, has also been going really well, too. In August, Samsung announced the new version with updates to the headset itself, some new buttons and ergonomic features. There are over a million people who used Gear VR in the month between July and August alone, so just a tremendous amount of excitement from users in the community.

> “Our big focus is doing what's best for VR, getting that flywheel started, where devs make great content, and consumers buy it and love it.
> *Nate Mitchell, Oculus*

There's never been a better time to jump into VR, whether it's high-end VR on PC with Rift or more of that mobile VR experience – they're both great, they're both fantastic and they're only getting better.

How have you seen the PC, console and mobile VR sectors evolve?
Here's my personal opinion: people view both of them just as 'VR'. If

you've tried Gear VR, which we worked on, and you liked that, you're going to love Rift. In many cases, if you've tried Rift and loved that, you're going to love Gear VR.

One thing that's really clear is that developers are really excited about Touch. We've put a huge amount of work into Touch to really nail what we call 'hand presence' – this concept of actually feeling that your virtual hands are your real hands. That's something we think is totally fundamental to VR.

On top of that, you can do social interactions with Touch – give a thumbs up or point. In *Wilson's Heart*, for example, you can actually point and use your finger to interact with objects such as a light switch, which is a totally new experience in and of itself. It just makes it overall really natural and intuitive to pick objects up, use them and interact with them.

On the mobile side, we're seeing a real depth to the quality of the games and experiences that are there today – a lot of really neat, deep stuff that you can do on Gear and totally immerse yourself in. The other thing we're seeing a lot of is 360 video on both platforms, but especially Gear.

How do you help devs to understand what they could achieve by implementing Touch support – and VR in general?

Developers are super smart – they get their hands on Touch and actually surprise us pretty quickly in terms of what they do. They start experimenting and doing totally novel things, stuff that we never thought that they would ever stumble upon. If you look at the diversity of the content, you see that developers are using Touch in all sorts of different ways. They're really surprising us.

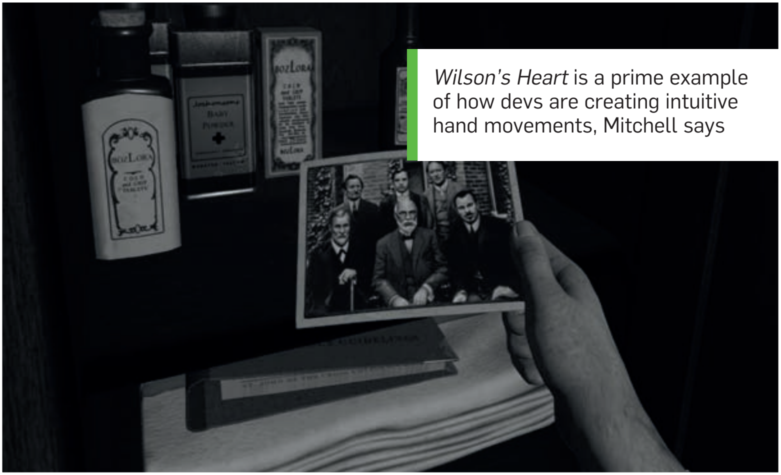
One of the things we're thinking about with Touch is having an initial tutorial during the setup process that you can re-run anytime and teaches you the basic interactions. It will teach you to pick up an object or pick up an object and use it at the same time, or point, or give a thumbs up, or make a fist – whatever.

After that, Touch is pretty darn intuitive and natural for most folks – they just start picking up things in the world or knocking things over.

We don't want to force any sort of consistency, but of course we offer advice on best practices, we take learnings from the community and what developers are doing. We have docs, tutorials and videos, but there's always going to be people who are doing wacky things – and that's totally fine with us.

One thing we hear from devs is they're unsure how to price VR games. Have you been able to help devs with this?

We probably haven't totally nailed it because the industry is so early, but we're working with every one of our developers to set the right price and to help them with marketing in the Oculus Store.



Wilson's Heart is a prime example of how devs are creating intuitive hand movements, Mitchell says

If you talk to any developer in our store, the overall experience they have reaching our users is very positive. Likewise, if you go to the Oculus Store, you know everything in there reaches a super high quality bar, is priced really fairly and is rated really well on the comfort side.

There's not a 'one size fits all'. Some of the absolute best, most expensive titles across the VR space are some of the most successful – and so are some of the cheapest. Price is all about setting the right expectation with users in terms of value. Some games offer huge amounts of value, others are tech demo-type experiences, so there's a lot of flexibility in price.

How are you encouraging smaller devs to advance past demo-like VR experiences?

There are a set of small developers – one to five people – who are building some of the most exciting games on the platform. *Darknet*, for example, was a VR Jam winner and went on to be a Gear VR launch title, then a Rift launch title – and the team was tiny. It was basically E McNeill, one guy, and some contractors. *Keep Talking and Nobody Explodes* is another great game made by a very small team.

It's not that hard to go build a VR experience with tools like Unity and Unreal, which have really democratised game development. Anyone can be a VR developer, and all of our hardware doubles as a development kit so that makes it really easy to get in there. There's a growing audience but you're not going to see a *Call of Duty*-style windfall where it's 20 to 30 million sales yet.

We're investing a huge amount into the ecosystem, funding developer content and new titles. That helps take some of the risk off developers who obviously want to go big, but know that there's challenges there on the economics.

Our big focus is doing what's best for VR, getting that flywheel started, where developers can make great content, consumers buy it, love it, and then developers can keep reinvesting.

What are the biggest ways you foresee VR transforming on the tech and design side for devs to push the medium forwards?

Right now, the main one for us is Touch. It's less about challenges and more about getting it in their hands, getting the software there, getting everything just in a really great place where they can knock it out of the park really easily. We also want to bring VR to more users, so we're looking at a lot of innovation around performance and the quality of the experience.

One thing that's always been fundamental for Oculus is delivering comfortable VR, and we think that we are the most comfortable headset out there – the experience is smooth and tight. We've really invested a tremendous amount in minimising latency to every last millisecond. We want to keep pushing limits there and keep innovating. All those tools we give out to our developers are to help them go be successful and build great games.

Where do you want to be in another 12 months?

The Rift team is shipping software every single month. We're evolving the platform, we're bringing new features to users and adding new features to the SDK. We're also laser-focused on Touch. We want to make that a super successful launch and make that a dream when you unbox your Touch: you plug it in and it all works and is just great.

On the mobile side, we're shipping updates to Gear VR every couple weeks and really just updating it. We have all our apps – Oculus Video, Home, Photos – and we're constantly evolving these things to improve the customer experience for folks.

If you look at the beginning of something like a console generation, you want to give developers time to understand the hardware and give them more tools to be successful because they'll do so much. VR is new on the game design front, it's new on the game development front, the hardware is new, so one of our big focuses is continuing to work with developers to give them the tools that they need to continue this generational leap in terms of content.

We like to think about everything that's on the Rift today being generation one and generation two in a way, because it's staggered. After three years of dev content on Rift, people started with Touch – we're a year and a half to two years into some good solid Touch development.

The next generation that happens over 2017 and 2018 – that's a really key focus for us and making sure that's great. ■

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SHARED ROOMS: DESIGNING MULTIPLAYER VR

Multiplayer will be key for the mainstream adoption of virtual reality, but comes with a fresh set of problems to surmount. **Jem Alexander** asks studios what stands between us and the perfect social VR experience

The future of virtual reality lies in connected, multiplayer experiences. Thanks to the relative youth of VR as a medium, these also happen to be the most challenging to develop. New tech means a new set of problems and constraints to overcome, but also the potential for completely unique social applications and competitive games.

Developers agree that with real-life physical movements mirrored in VR thanks to motion controls comes the new sensation of ‘social presence’. The feeling of sharing a space with other players that transcends even the most immersive MMO or online shooter.

Physically interacting with real people in a shared world has the potential to rewrite the rulebook, even at this early point in the technology’s lifespan.

David Votypka, senior creative director at *Star Trek Bridge Crew* dev Red Storm, foresees this as being a key selling point for virtual reality as the technology progresses.

> **Player-to-player interaction is going to become more prevalent in VR simply because when it works, it’s magical.**
> *Piers Jackson*

“There is a growing consensus that social VR is going to be one of the tech’s most powerful uses and most influential aspects,” he explains.

“I’ve been in that camp for almost two years now, because VR can literally make people feel like they are in an environment with each other as opposed to simply viewing each other’s avatars, known as social presence or shared presence.

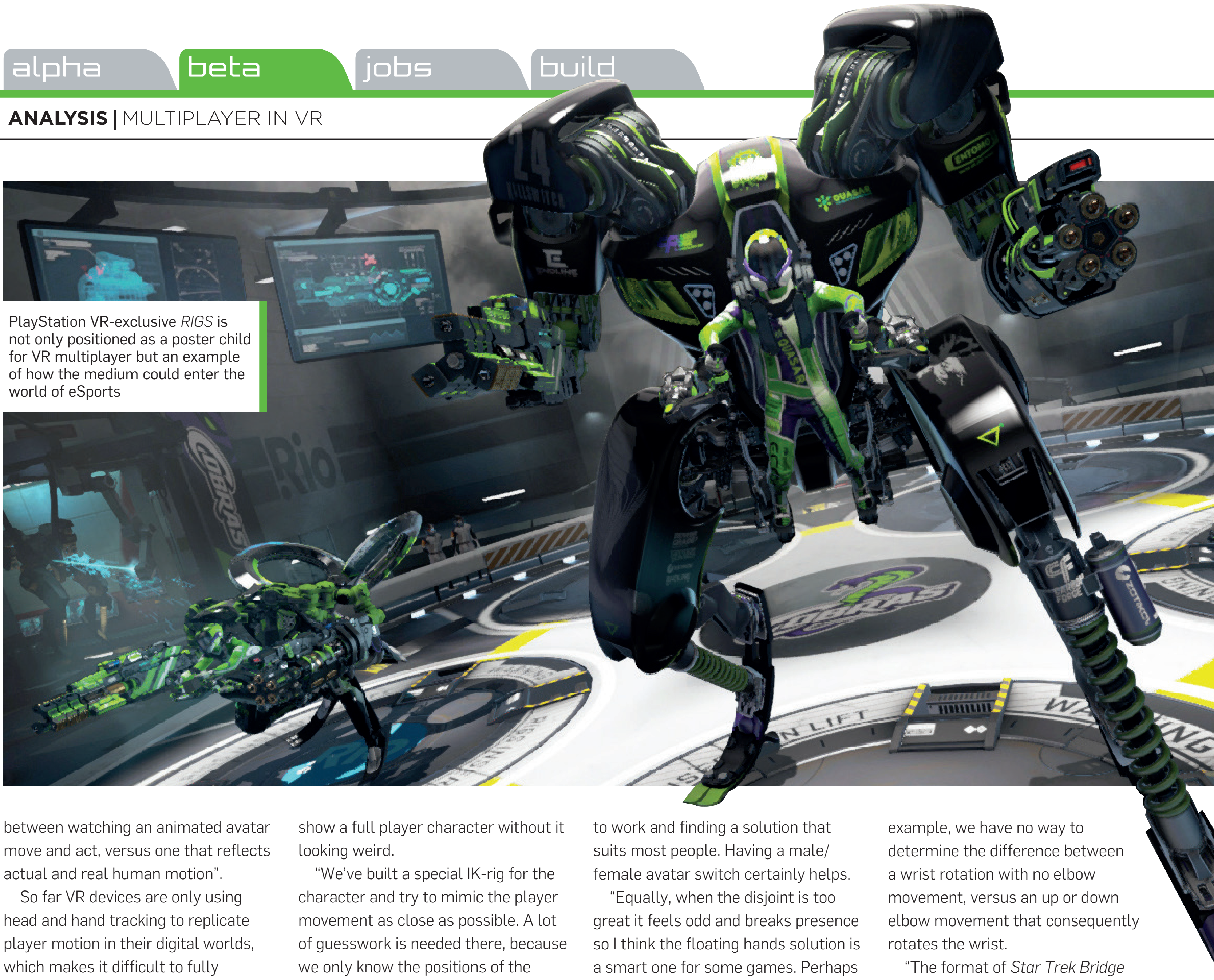
“As technology advances and as we get more data from VR hardware to represent users more accurately in the VR environment, the more powerful and compelling social VR will become.”

Piers Jackson, game director at *RIGS: Mechanized Combat League* developer Guerrilla Cambridge, feels that this idea of shared presence is just the start: “The first waves of VR titles will largely focus on delivering on presence and experience. But going forward, player-to-player interaction is going to become more prevalent simply because when it works, it’s magical.”

BRINGING PEOPLE TOGETHER

But it’s the technical constraints that currently limit person-to-person interaction, a by-product of the newness of the hardware, that are also the most troublesome part of developing multiplayer experiences in VR. Top of the list is mapping the player’s physical movements onto their in-game avatar.

Votypka believes that social presence “occurs because our brains can immediately detect the difference



PlayStation VR-exclusive *RIGS* is not only positioned as a poster child for VR multiplayer but an example of how the medium could enter the world of eSports

between watching an animated avatar move and act, versus one that reflects actual and real human motion".

So far VR devices are only using head and hand tracking to replicate player motion in their digital worlds, which makes it difficult to fully recreate complex movement using the human body's full range of limbs, joints and appendages.

"If we start thinking about multiplayer VR games that feature full body avatars, freeform locomotion, the ability to manipulate objects, and to also interact with other avatars by way of combat or handing off objects to one another, the level of complexity increases quite a bit," Votypka tells us.

"Overcoming these challenges requires approaching each of the aforementioned features with solutions that involve adapting previous techniques in new ways and, in many cases, it may very well require a solution that hasn't been done before."

Developers are working hard on coming up with solutions for these problems but, in the meantime, some are choosing to present players to each other as nothing more than a floating head and hands.

"That's obviously not the ideal solution," says Lauren Bruins, co-founder of *Arizona Sunshine* developer Jaywalkers Interactive. "We're still investigating how we can show a full player character without it looking weird.

"We've built a special IK-rig for the character and try to mimic the player movement as close as possible. A lot of guesswork is needed there, because we only know the positions of the headset and the hands, so we try to keep its movement within bounds that make sense."

Guerrilla Cambridge has a similar solution, even though the mech combat setting for its game makes things easier on the team.

"We wanted players to have full immersion in the game and so our pilots have full body representations," Jackson says. "Their hands are positioned where the player's hands are likely to be and we also track the player's head position and use IK to move the shoulders to compensate.

> **Multiplayer for VR will create completely new experiences that could help drive adoption.**
> *Clemens Wangerin*

"Having said all that, we did spend a lot of time getting the pilot's position to work and finding a solution that suits most people. Having a male/female avatar switch certainly helps.

"Equally, when the disjoint is too great it feels odd and breaks presence so I think the floating hands solution is a smart one for some games. Perhaps this is a route we might have gone down if we hadn't effectively dodged many of the problems by having the Rig do all of the motion for the player."

ELBOW GREASE

Votypka details the true extent of the issue: "The challenge specifically with arms is that developers have no way to reliably establish where the elbows of the player actually are. For example, we have no way to determine the difference between a wrist rotation with no elbow movement, versus an up or down elbow movement that consequently rotates the wrist.

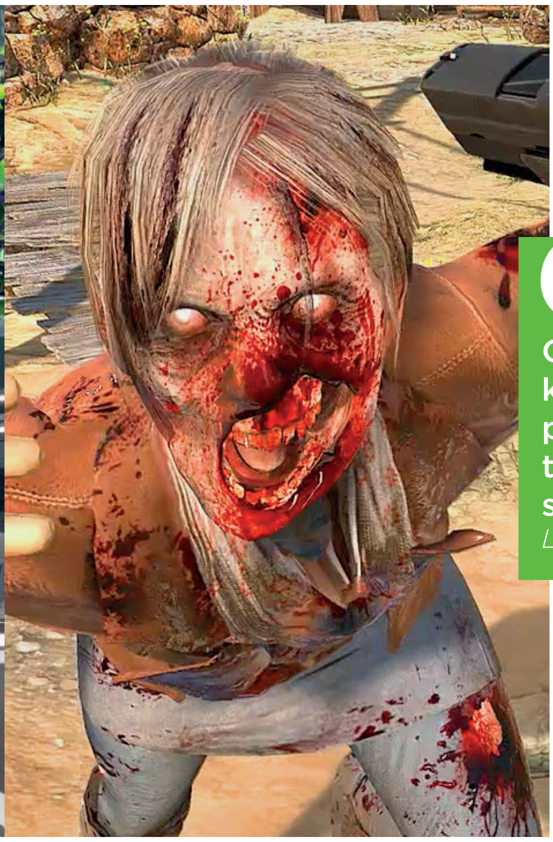
"The format of *Star Trek Bridge Crew* also really works for us since it is a seated experience and the interaction space for the player is generally focused on the panel in front of them. This reduces the problem set we have to deal with.

"While there will be instances, where the player's real-world arms won't precisely align with their in-game arms, the differences are minute enough and infrequent enough that we have less disconnect than we would if we used floating hands.

"We've had hundreds of players try [*Star Trek Bridge Crew*] so far, and when they actually get to see their arms move in the game, the feedback has been really great; there's no question that it greatly adds to their sense of presence."

But thankfully, at least in the short term, exact one-to-one mapping isn't completely necessary because the human brain does a good job of filling in the blanks.

Also, as Bruins explains: "Other players don't know the exact way players are standing in their room, so there is some leeway. I think



we're on the right track, but I definitely can't say we've overcome the challenge completely.”

Votypka adds: “It seems more and more likely that the next generation of VR hardware will provide developers with greater body data to utilise. For example, arm and elbow positions or camera-based body tracking, as well as tracking eye positions and even facial expressions.”

SHOW YOUR MOVES

Another problem facing Virtual Reality involves player movement – buzzworded as “locomotion”, because long words are cool.

“Moving in VR, other than movement you do yourself, is not a pleasant experience for many people – yet,” Bruins explains. “Because of this, most games use teleportation, as do we, which is strange in multiplayer if you see everyone teleporting around. We've investigated a few solutions and think we're on the right track.”

One way of combatting this is limiting the player to an exclusively seated experience. Clemens Wangerin, MD of VTime Limited, which develops online virtual reality social experiences, says: “Creatively almost anything is possible, but we find that movement or locomotion of the user needs to be handled with particular care. That's one of the reasons we designed VTime as a seated experience and use movement sparsely. This results in a higher comfort factor and leads to more users spending more time in your title.”

Seated experiences also “almost completely bypasses risks for motion sickness in VR”, according to Votypka.

“But locomotion is a solvable problem and it is being solved by advances in both hardware and software,” he says. “In the worst case scenario, people who are very sensitive to movement in VR can use teleportation mechanics.”

In an ideal world, everyone will be taking advantage of large virtual reality play spaces, making full use of the format's room scale features. Jackson sees the issue of space, as well as human laziness, as being limiting factors when it comes to fully physical multiplayer environments.

“I'd like to think that a physical motion approach to multiplayer games is achievable,” he says. “But I suspect it will need to overcome the issues of available space and will have to create a level of engagement that provides an experience which is totally original – because, unfortunately, a sedentary experience sat on your sofa at home is frankly more convenient for most people.”

Votypka believes these issues are all just teething problems and that “additional mechanics are being developed and discovered that mitigate discomfort from moving in virtual reality”.

> **Other players don't know the exact way players are standing in their room, so there is some leeway.**
> *Laurens Bruins*

“Because there is a very wide range for how people react to motion in VR, I believe that one of the keys from a design perspective is to build games with locomotion schemes that allow users to customise them according to their level of sensitivity,” he suggests.

“Also, it's been proven that for many people the more they use virtual reality, the more desensitised they become to motion sickness, which is another reason that users should be able to change the locomotion settings in a game as their sensitivity changes over time and use.”

Once developers come to grips with this new medium and a set of best practices begins to emerge, the consensus is that multiplayer will be the key to mainstream adoption of virtual reality.

“Multiplayer ‘designed for VR', and in particular anything with persistency to it has significant scope to break new ground and create completely new types of experiences that could help drive adoption,” says Wangerin.

Bruins agrees: “Multiplayer VR games that have clear representations of other players might be even more social than traditional multiplayer games, because player movement directly translates to the player's avatar. Movement and emotions can be very clearly conveyed, which was actually quite surprising when we first tried it out. I definitely think multiplayer will play a major role in the adoption of VR.” ■

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EYEBALLING INTERACTION

Spinning interactive narratives for VR experiences is a daunting process. But as Sequenced creator Apelab has proved, done right, it can present a tantalising new way to captivate users. **Will Freeman** reports

Apelab is a Swiss studio already well versed in the nuances of spinning interactive yarns through VR headsets. The team also devotes energy to telling non-linear stories on mobile, but of late, VR has occupied much of the outfit's time.

And its founders are convinced that the challenges traditional interactive narratives and general VR storytelling present are not entirely distinct.

"We see them as one thing," confirms CTO and game designer Michaël Martin. "We haven't tried to separate them in boxes of what 'storytelling' or 'interactivity' should be – the two actually match very well."

The studio's four founders have learned a great deal since the team's formation early in 2014, particularly through developing *Sequenced*, a thoughtful animated adventure born as an experiment in 360-degree experiences on iPad, before being fleshed out into an interactive VR adventure for Oculus Rift, PlayStation VR and HTC Vive. Fortunately, Apelab is more than happy to share the lessons it has learned.

"Branching is not the only solution; it's one of many," asserts CEO Emilie Joly on the studio's open approach to how stories can be told in VR.

"You have to think of the story more as a space or a stage; a good mix between theatre and architecture. We tend to think in micro-narratives as well. Instead of writing a script that is completely dictated by the writer, you have to write an organic story, an organic space in which the user will evolve depending on the rules that you've set for this world. World-building is a major component."

SEEING STORIES

That's certainly the case with one of Apelab's most recent ongoing projects, *Break a Leg*, which was born from an R&D project for Google's Project Tango. Now a fully-fledged VR experience, it puts the player in the shoes of a Houdini-inspired illusionist realising their magical powers for the first time on stage. From there, it is the 'player' that sets the agenda through the performance on a virtual stage, using focused gaze to interact with the world around them.

Sequenced also uses Apelab's 'gaze' approach, where a user influences a narrative through the focus of their attention. Developing this method has even led Apelab to building the soon-to-be-released toolset Gaze Interactive, so scriptwriters, engineers and designers can build experiences where virtual environments react to a given user's position and orientation.

"Gaze-based interactions are highly intuitive," offers Martin. "They allow us to figure out what the user is most interested in, and guide the narrative in that way. Especially in an environment where the user can freely decide where they look, it becomes important to know exactly what those moments are to direct the scenes accordingly."

At the same time, the technique has opened the doors to a new method of storytelling in VR. It's also a technique other studios could consider, whether making games, or other experiential forms that don't fit traditional definitions. In fact, for Apelab, interactive storytelling in VR may count as an entirely new form of its own.

> **"Start with paper and pencils. Prototype very quickly. Never write your whole structure, thinking it'll work without testing. Play out experiences with friends like a stage play.**
> *Michaël Martin, Apelab*

"That's definitely what we think," says Martin. "It's mostly about finding the language. We can find a lot of what we're looking for in video games, but not all of it is in there. To make VR the new medium it deserves to be, there is work to do on the content and user experience side. Make people experience something they could never translate to TV or on their computer screen."

Recognising such content as an entirely distinct form may also help with the creative process.

"Trying to directly translate a film or a game in VR usually doesn't work," says Joly. "It's difficult to put any rules [in place], even if some try to do it. The rules change over time.

"Be bold, try new things. VR is an amazing way to transport people into impossible places doing things they could never do in real life, live experiences that can only be lived here and now. You can do some really crazy and innovative stuff here. Let imagination take over. Think of the user, how they move, what they can do, grab, look at, and how all this environment reacts to their presence. That's how you script an interactive story in VR."

USER-MINDED DESIGN

VR has famously put a new emphasis on prototyping and early stage testing. Many who have made good with the medium will eagerly recommend spending a little more time than usual lingering at the opening chapter of the creative process. As it is with other VR experiences, so it should be when trying to deliver non-linear narratives.

"Start with paper and pencils," states Martin. "Prototype very quickly. Never write your whole structure, thinking it will work without testing. Be as iterative as you can. Experiment with other content to see what is out there, and play out your experience with friends like a theatre play."

Beyond that, delivering a convincing interactive story in VR comes down to one of the founding rules of games making; design for the user experience first and foremost.

"Think of your user, where they start, what they can do, and when," Joly urges. "What characters do they encounter? Are they a character in this story? Are they simply a witness? Then go step-by-step, create your scene, [and build] your space with simple forms.

Joly also suggests avoiding breaks in the narrative in order to make the experience as smooth as possible: "Give the user the illusion things are moving along, or you'll lose the story and the experience will feel 'chunked' into pieces. Let them explore your space, and take attention to details. Details are awesome in VR. You can take the time to look everywhere and discover something new."

When it comes to the types of experience Apelab attracts so much acclaim in delivering, hurrying the user is rarely the best path to success.

And, to an extent, the same could be said of the general approach to building interactive stories for VR. The technology remains in a nascent stage, and so does the design rulebook for telling tales in virtual realities.

With so few consumers regularly playing VR at the moment, a great deal of patience is needed before the industry is at a point where its audience understands the form.

However, while rushing to market is far from advisable, the potential interactive storytelling brings to VR is well worth embracing today. If the attention being showered on Apelab's output already is anything to go by, this new way to engage users is going to be hugely important in the coming months and years. ■

FANTASTIC MOVES

Radial Games' Fantastic Contraption sees virtual reality users constructing bizarre vehicles by physically moving around their creation as if it were real. CEO Andy Moore tells us how his team ensured the title is still accessible to all

Where did the idea for the game originate?
The original 2D browser game was Colin Northway's idea, which I believe came to him in a dream of all places.

We had been looking for a way to make *Fantastic Contraption* into a 3D product for a while, but the problem of translating 2D motion – that is, mouse and keyboard – into a 3D space was really difficult.

The idea was shelved for nearly ten years. When VR came along, the solution just clicked into place. Tracked 3D hand controllers solved everything.

Why design a room-scale game?
Room-scale space isn't required for *Fantastic Contraption*, but it's a much better experience – like seeing your favourite music live. There are definitely some game designs that require room-scale, however, and those are new works of art I'm incredibly interested in experiencing and developing in the future.

What complications did optimising for different play spaces create?
Designing something that works for room-scale, standing-scale, and seated-scale takes a lot of work. Many developers don't even try – it's just too difficult to implement with their content.

Thankfully, *Fantastic Contraption* has a relatively simple visual design, so getting it working at different scales was possible for us. It's still a lot of work to get cross-compatibility of scales going, of course – we're just thankful we were able to take advantage of them all.

How can you possibly account for potentially unlimited player interactions given the game has motion controls?
We intentionally designed *Fantastic Contraption* to be a "less busy", more sparse environment. This allowed us to add interaction to every single object in the game. Yes, you can pet the cat. Yes, you can throw the cat off the cliff. Yes, you can pull your own eyeballs out of your virtual head. Anything a play-tester ever attempted, we've implemented into the game.

Other developers are more focused on having a rich, content-full experience with linear narratives. Those scenarios are much more difficult to work around in regards to unlimited player interaction, and I consider them fundamental design flaws; the content was not made with standard VR player behaviour in mind.

> **Don't pontificate on what you could make. Build a new prototype every single day. Go now. Make something.**
> *Andy Moore*

The most important thing in VR is a sense of presence. Nothing ruins that more than telling the player: "No, you can't do that, because I said so." Of course, no developer alive today was born with VR and has an intuitive sense of what a "perfect VR title" is – ourselves included. We're all super excited to see what kids today make tomorrow; what obvious design patterns did we miss?

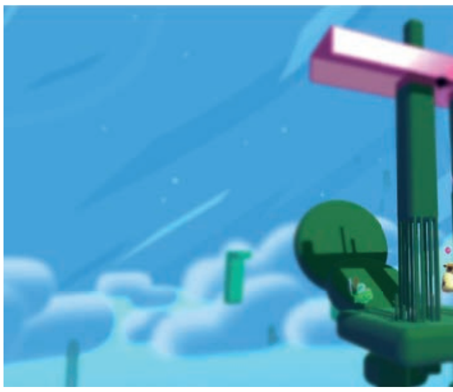
How do you make a game intuitive so players know how to physically move without being told?
Thankfully, all humans go through a tutorial phase called 'being a baby'. They learn how to use their hands and legs and move about their environment. We leverage this in *Fantastic Contraption* by making all interactions require no more knowledge than simply clenching your fingers.

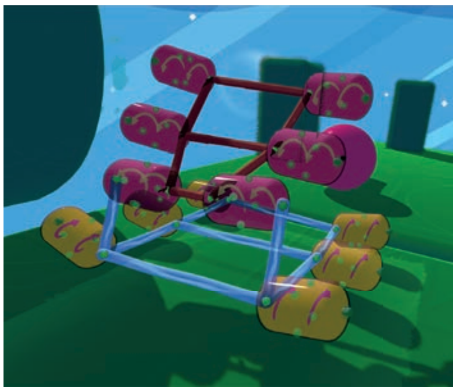
Our open design and inviting space makes people feel at ease to move about the area. Interestingly, people that are new to video games in general are absolutely fine with our game.

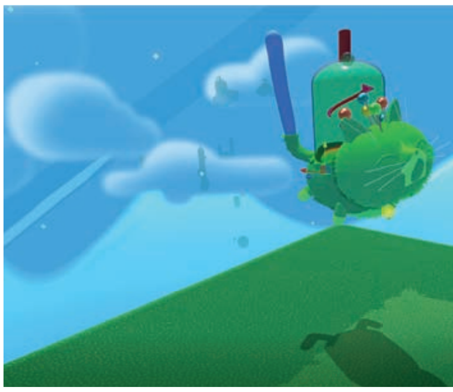
The only trouble we get is from seasoned gamers, those that have been told their entire lives that they should just sit there and use some sort of tool to reach something farther away – walking with a joystick, teleporting, using an attractor beam, and so on. Those seasoned gamers boot up our game and wonder what the teleport button is, forgetting they have legs.

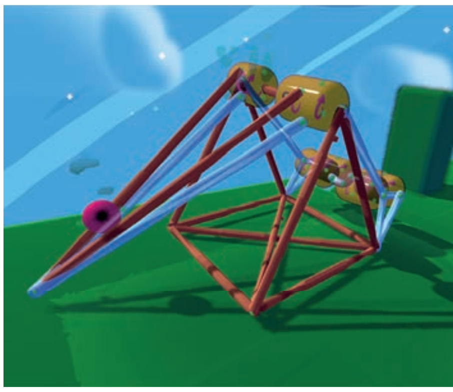
We're not sure this is a problem we can easily solve via software design. This is largely a lack of exposure to the tech, and a general distrust of the machine to "save you" from physically walking into a wall. Systems like Valve's Chaperone help with this, but educating seasoned gamers to work with a new tech is a hard nut to crack.

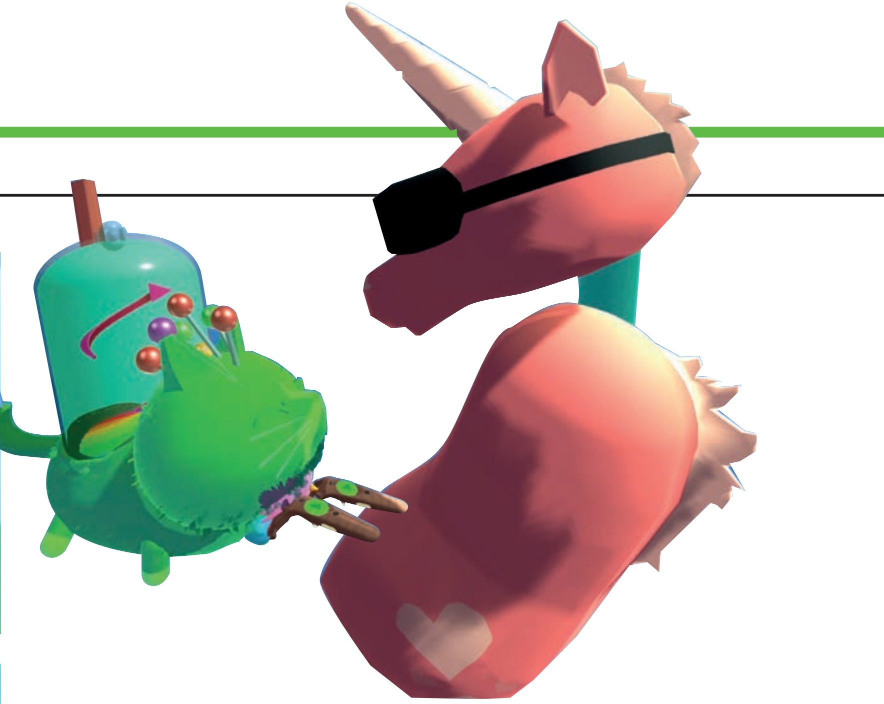
The best we can do is spawn a player into our world, and then force them to walk over to an object to pick it up. Thankfully, after a few tries, people seem to get it and start moving about. It's not as if anyone has ever taken off the headset and given up at this point.

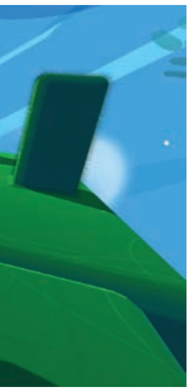




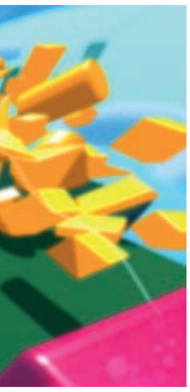








Your Contraptions



The game sees players moving around a virtual object to fix various parts, even crouching down to reach the underside of the vehicle. How careful did you have to be with the positions you're encouraging players to get into? How flexible or nimble do you assume players will be?

Though the game is best played reaching high up, crawling around on the floor, and walking big strides across your room, we were careful right from the start to make sure the game was still accessible to people with less mobility.

You can play the game seated, you can play it standing, or you can play it in full acrobatic mode roaming about your play space. Our minimum requirement is one arm and one hand – everything else just makes the experience better.

For those that don't wish to play with a scaled-model version of the game, we also introduced shortcuts. All the parts you need are attached to your body – you grab wheels from your head, or sticks from your back – and you can use the grip buttons on the Vive controller to perform a 'grabby claw' action.

There's not much distinction between our 'pro tools' – shortcuts for hardcore players – and 'accessibility tools' – features introduced with just accessibility in mind.

What was the biggest technical challenge, and how did you overcome it?

Suddenly needing to create content at greater than HD-levels of pixels, at 90 frames per second, without ever dropping a frame – even during a loading screen – was new for us.

Sometimes the only way you can overcome such problems is with a little elbow grease.

What tech are you using? What's powering the game?

We started work in virtual reality before the Vive was announced, which means there was not much third-party software that could help us out.

We built our own custom tech to deal with many VR-specific features. We also use Unity to take care of our rendering pipeline.

Why opt for the Vive first over the Oculus? What did it enable you to do?

Fantastic Contraption requires an accurate 3D controller input and a tracked HMD – otherwise the interface doesn't work. We have been a launch title for every single platform that has these features.

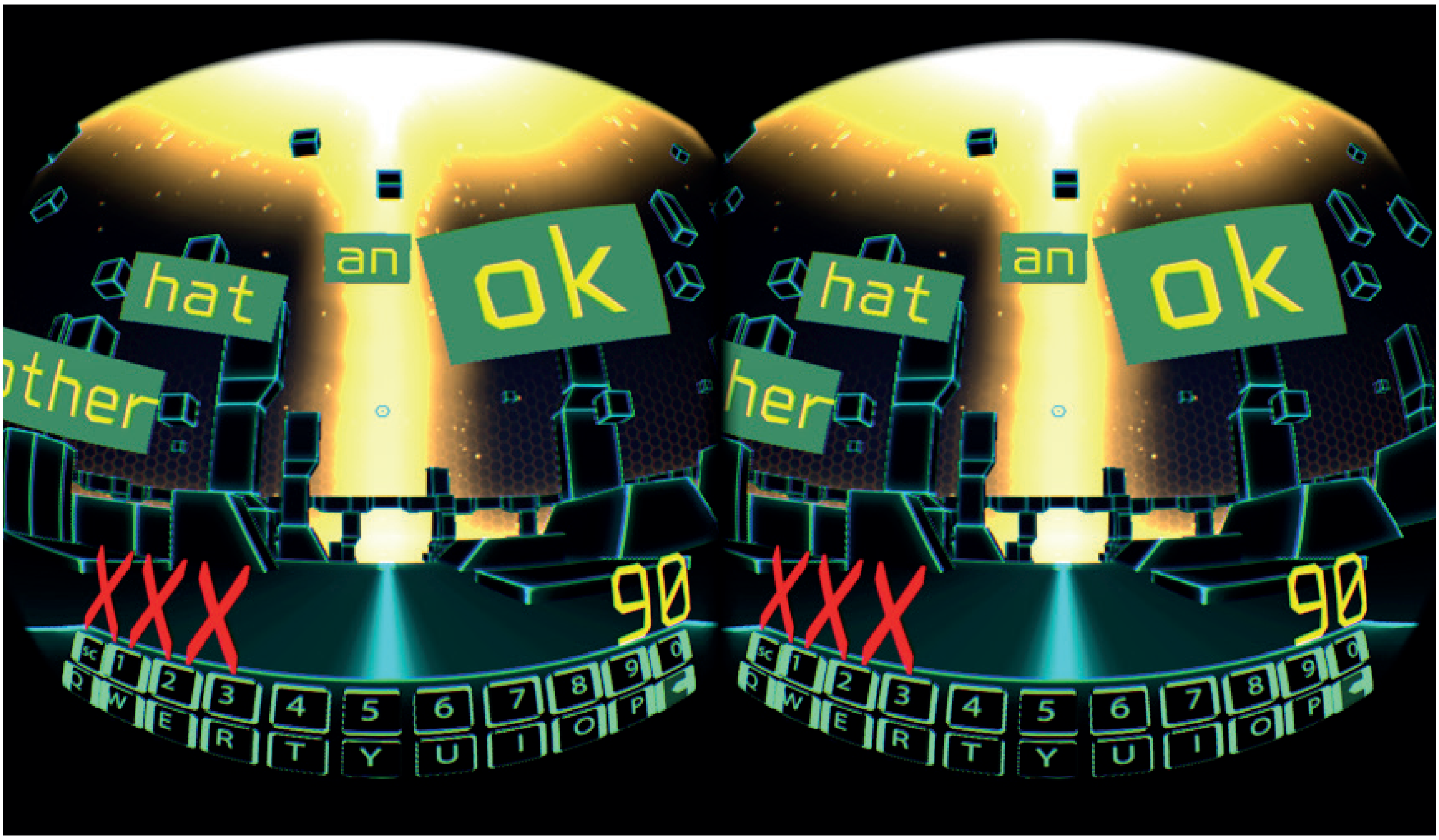
The technology and hardware requirements – and limitations – are nearly identical between Oculus and Vive, so porting basically took a day of technical work and a bit more just to get the right visuals, such as our hand models, animating correctly.

Though we originally built the game to be room-scale only, we had always intended to support standing and seated scales on Vive as well, so the Oculus launch his spurring us on to get that completed sooner.

What advice would you give a developer building a similar title for VR platforms?

Don't just pontificate on what you could make. I expect you to build a new prototype every single day. Go now. Make something.

More importantly, don't take your old ideas and try to port them to VR. Think about the limitations – play space, scale, unlimited player interaction, hand controls – and make something amazing that could only work there. Those'll be the titles that shine tomorrow. ■



VR'S NEW NORMAL

Within the walls of Californian outfit Labcoat Studios, a thoughtful approach to game design is proving convention and experimentation aren't diametrically opposed when it comes to VR. **Will Freeman** reports

At Labcoat Studios, the team likes to approach VR content with an experimental mindset.

It's a trait woven deep into the outfit's creative approach, borne from perhaps the most experimental spin on the development process; the humble game jam.

Labcoat's four founders formed their creative bond through tackling jams together, and ever since, they've learned a great deal about taking non-traditional forms to VR headsets.

"We had all worked in our respective fields on 'normal' gaming, storytelling and educational experiences, and really saw the potential to do a lot more once we started working with Oculus Rift back in 2013," reveals co-founder, composer and sound designer Brian Grider. "The developments in VR and graphics cards in the last three-to-five years have made possible what we only wished we could do prior to 2013. It really is a brand new frontier to explore."

Grider and his three colleagues decided that if they were going to bet their new operation on VR, they would concentrate their energy on the experimental and atypical. At the same time, the team wasn't out to make projects that were arcane or unusual for the sake of contrarianism.

> Everyone is just exploring, and that exploration is probably the best approach to finding solutions.
> *Brian Grider*

As such Grider – along with lead programmer Mike Arvalo, lead 3D artist and design Jeff Macalino, and programmer and motion capture specialist Wael Elhaddad – is already thriving, bringing content to VR headsets that is, on first glance, not an immediately obvious fit for the form.

And the team is entirely confident that 'non-traditional' can also be commercially mainstream.

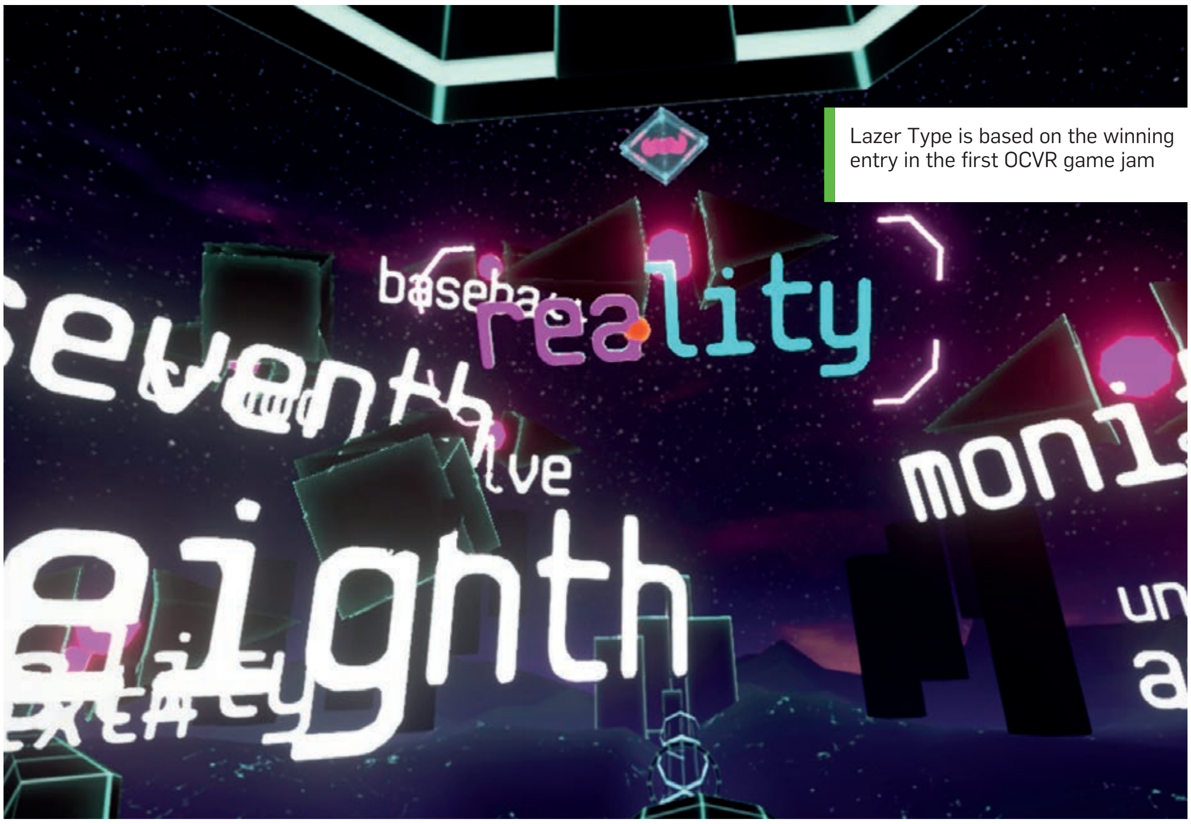
"I think nearly every industry out there is exploring how to take advantage of these new technologies, and ultimately monetise them," Grider muses. "We're constantly seeing new companies incorporating VR into their commercial operations and I believe this will only continue to grow. Just like any new technology, the commercial potential is only limited by the breadth of the ideas."

That breadth includes everything from the conventional to the fringe.

KEYBOARD CATS

Eccentric keyboard skills VR game *Lazer Type* might be the most immediate example of how Labcoat Studios do things a little differently.

Based on a Labcoat concept that won the first OCVR game jam, and now being reworked with collaborator New Blood Interactive, it uses virtual reality to do something rather peculiar.



Lazer Type is based on the winning entry in the first OCVR game jam

Just as *Typing of the Dead* made an unlikely but beloved bedfellow for the arcade cabinet, *Lazer Type* – from an academic perspective, at least – employs virtual reality to teach players how to not use VR. But why?

"I think we're always trying to come up with new ideas that we think will work well within the scope of VR, but sometimes these ideas might not fit what is expected of the medium," Grider responds, adding: "We wanted to come up with a game to teach, exercise and test a skill that almost everyone in the creative and development workforce uses, but we wanted to make sure it was done in a way that VR would help rather than hinder.

"After prototyping, we felt that a fast-paced, competitive typing training app worked really well."

Labcoat certainly isn't the first to espouse one of the founding golden rules of current generation VR design. You won't have to go far to find a VR developer recommending that you consider no idea unsuitable for – or suited to – virtual reality until you try it. In this time before the waters of design convention have settled, assumptions just shouldn't be made.

"If your team has an idea that may turn into something really interesting, spend a couple of hours just setting up some basic game mechanics and see if it might work," Grider suggests.

"If the game or experience is really complex, maybe break it down into small components and prototype those. When thinking about a non-traditional idea, you don't need to feel too committed. If it's not working out, move on to the next one."

That approach, however, is best tempered with a healthy respect for conventional game design.

A LAND BEFORE OCULUS

While the post-Oculus impact of VR on the games industry has seen a collective learning experience as developers globally establish a new rulebook for virtual reality design, Girder and his team believe looking back is as important as looking forward if you want to experiment within a user's headset.

"Storytelling, especially, is an art form that has been crafted and developed for most of human history, and I think the traditions and methods will always be rooted mostly in good storytellers with a good story," Grider notes. "Technology has always been an amazing way to deliver and enhance stories, but most storytelling mechanics will stay the same – even with VR.

"The biggest thing is trying to figure out how to make VR serve the story, rather than hinder it, which some people are starting to do a really great job with. When we look past storytelling to the mechanics of entertainment in VR, I think anything is fair game. If it works and feels good, then it's successful, whether it's traditional or untraditional in design."

Maybe, then, the reality is that when something as disruptive as VR arrives at the mainstream's door, the concepts of 'traditional' and 'experimental' forms present a moot distinction. Arguably, games makers as a whole have not arrived at any framework for convention in virtual reality content design yet. If that's true, then without the typical established, the notion of anything being atypical is rather meaningless. It is in that spirit, to an extent, that Labcoat approaches its design method.

DO THE RIGHT THING

Being rigidly experimental, then, isn't necessarily the right approach. Rather, something much less tangible is at the crux of what it is to make worthwhile virtua reality content.

"All art and entertainment has an underlying soul to it in our opinion, and the most successful projects – both commercially and otherwise – are the ones that really speak to people," Grider offers. "With our projects, we tend to think the most important thing is just following what feels right whether it's going to push boundaries or just be purely for fun. We think honouring the soul of the project is the most important part of developing a successful game or experience."

Honouring the soul of a project may not be an easy fit for Scrum framework boards or game design documentation, but it has served Labcoat Studios well. And with that frame of mind, perhaps the notion of completing the virtual reality game design rulebook would be better replaced with a willingness to accept that every VR content project should best be considered as an experiment. VR, it appears, may have upset the linear spectrum on which the conventional and unusual sit at polar opposites. But that doesn't mean there is no space to be experimental.

"I'm sure that over time new solutions will be discovered for a number of these problems, but there are some limitations – like locomotion issues – that will probably always exist," Grider concludes. "At the end of the day, everyone is just exploring and trying to figure it out together, and that exploration is probably the best approach to finding solutions." ■

EXPERIMENTALLY CONVENTIONAL

The team at Labcoat Studios make projects that intelligently contradict the notion that VR content can be polarised into 'conventional' and 'experimental'.

The teams' Gear VR game *Re-Entry*, for example, places the players in the most familiar of VR surrounds; the sci-fi cockpit. And yet the game presents a failing ship tumbling back to Earth.

The Light, meanwhile, takes Oculus Rift users to that oft-revisited VR genre, the horror game. But where most of its contemporaries hide their terrifying antagonists in darkness, Labcoat's effort makes a gameplay mechanic from bathing them in light.

And then there's *VR Typing Trainer*, an OCVR game jam triumph recently fleshed out into full release *Lazer Type*, which could be seen to use virtual reality to train users to go back to a most traditional of computing forms; the keyboard and screen.

Inside Labcoat's walls, it seems, convention and experimentation always walk hand-in-hand.

SMITH & SMITHERSON
PR VIRTUAL REALITY IAL ACCOUNTING
PROJECTED EARNINGS (TAX DEDUCTIBLE)
$
DAWN OF VR

Squanchtendo was founded by Justin Roilland (left) and Tanya Watson (below left)

LOCATION: Burbank, US
BEST KNOWN FOR: VR game *Accounting* (with studio Crows Crows Crows)
WEB: squanchtendo.com
EMAIL: hi@squanchtendo.com
TWITTER: @squanchtendo
Facebook: www.facebook.com/squanchtendo

STUDIO SPOTLIGHT

SQUANCHTENDO

Recognising VR's potential to raise a smile, two creatives with very different backgrounds came together to form a studio that respects the power of silliness. The result? An accounting game

When Tanya Watson and Justin Roiland first tried virtual reality, they both shared an instinctual reaction: the medium *had* to be part of their professional and creative lives.

That was before they had met, however. Watson had a significant career working with Epic, as producer on *Fortnite*, *Gears 2* and *3*, and lead producer on *Bulletstorm*. Roiland is a writer, animator, actor and director, most famous as co-creator of animated series *Rick and Morty*.

Despite their different backgrounds, after introductions through Roiland's agent and Cliff Bleszinski, the pair quickly knew they had to set up a studio to focus on VR.

When they got to talking about what they could do with the medium, it immediately became apparent that combining their diverse skillset and shared love of playful humour could inspire some rather distinct games. It was a creative gamble, though. Watson's previous experience with the world of TV had left her quietly cautious of the potential for collaboration.

THE TV STUDIO

"Frankly, when I first started talking to Justin, I didn't really think it would go anywhere," Watson admits. "At Epic we would have people from TV and movies interested in making games all the time. But it tends not to go anywhere because games is a different medium, with its own set of challenges that can seem tough if you weren't aware of them."

Roiland's approach was a little different. From the moment he pulled a DK1 from his head, he began schooling himself in the creative and technical process of making games.

"I realised then that he understood those challenges, and was really interested in tackling them," Watson continues. "He had a fresh perspective. That's important, because you're not solving the same problems in VR."

With Watson's distinguished triple-A background, and Roiland's skills as a storyteller, illustrator and animator, Squanchtendo is well positioned to compliment VR's suitability for content that crosses divides between games, film, television and other mediums.

THE COMEDY CLUB

Squanchtendo is a game-focused studio, dedicated to VR as a platform for comedy games.

"It's important for us to have fun with the creative process to make our kinds of games," Roiland offers. "Having fun and making yourself laugh the whole way through every step of production is something you don't see so often in games. I'm not against gritty narratives, because I love all games, I truly do. But the stuff I want to do with VR is really be silly, and not take it so seriously."

And Roiland says VR makes a great stage for delivering comedy: "The medium in and of itself, and being that it is so immersive and interactive, is powerful. It's the same thing that makes there be a lot of scary games in VR. But I've tried to trick a few friends into playing scary games through VR, and the second it starts, they freak out."

Comedy doesn't do that, Watson and Roiland agree. And that same power of presence and immersion does provide a perfect environment in which to make an audience laugh.

"*Accounting* is, for us, a taste of how funny and surprising narratives can be in VR," Watson says of the studio's first release, which was created with William Pugh's studio Crows Crows Crows.

"It's not got the length, and it's not quite the same level as the other stuff we want to make in VR. But it does give a taste, so you can expect more of that kind of thing in the future."

That taste is certainly one that puts a smile on players' faces, and while the Squanchtendo co-founders can't quite say what they are working on next, one thing is certain; the games Watson and Roiland are building are likely to be anything but sombre. ■

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CRY FOR TALENT
Crytek HR boss Kevin Moore explains what the firm is looking for
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WHY **VR DEVELOPMENT** IS NOT JUST "STICKING A HEADSET ONTO AN EXISTING GAME"

VR expert Dr Wendy Powell on why virtual reality devs need to rethink the whole creation process

The University of Portsmouth has always been a pioneer as far as virtual reality is concerned and intends to maintain this status.

"We've had specialist VR facilities available to our students for more than 10 years, and we are constantly updating the hardware and software in the lab," University of Portsmouth's Dr Wendy Powell tells *Develop*.

Powell has been studying VR for the past ten years, and has been a senior lecturer and then a reader in Applications of Virtual Reality at the university's School of Creative Technologies since 2008, making her perfectly qualified to give advice on becoming a good VR developer.

"The core skills are similar to those needed for good game development, but there are important VR-specific skills," she says. "Creating a sense of presence or immersion is vital, and poorly-developed applications can break immersion very easily. Part of this relates to optimising the graphics – remember, VR requires everything to be rendered twice, once for each eye – but also requires a really good understanding of the importance of visual scale, viewpoint and the scaling and calibration of input and tracking. For example, it's really unpleasant to walk towards a virtual doorway and find that you're passing through it with your 'head' going through the doorframe."

She added: "It's also vital to understand the effect that moving around in VR affects our entire body – poor design can result in cybersickness, including headaches, disorientation, nausea and other unpleasant symptoms. Good design can minimise these effects."

Powell further said that devs should rethink the entire development process when it comes to VR.

"Many good game devs approach VR as if it is just sticking a headset onto an existing game, but this rarely works. Everything from the digital assets to the gameplay narrative should be designed for VR, and testing should always be done using the full VR setup, not just viewing it on a desktop screen. The methods of interaction and navigation are vital – you can't rely on devices like keyboard and mouse, and you really need to totally rethink the design of interfaces and input."

> **It's vital to understand the effect of moving around in VR on our entire body.**
> *Wendy Powell*

The University of Portsmouth even has a specific research group looking at the way we interact with VR and how the system design can impact behaviour and experience.

"It's really worth getting to grips with some of this in order to design from a position of understanding the interactions rather than just following a set of guidelines provided by a VR hardware manufacturer. This understanding is fundamental to good VR development, and we make sure that this is embedded in the teaching on our specialist VR units." ■

MOVERS AND SHAKERS

The latest high-profile hires and promotions

DEVELOP

Develop welcomes a new deputy editor this month, as freelance writer and editor **SEAN CLEAVER** joins the team.

Cleaver has been a freelancer for the past five years, writing for *GameSpot, VICE, Pocket Gamer, PC Gamer* and more.

Editor **JAMES BATCHELOR** said: "Sean has already proven himself to be a hard working and accomplished journalist in the games industry. He will be an excellent addition to the *Develop* team."

Cleaver added: "*Develop* is a great place to be at a time when the games industry in the UK is growing, improving and filled with creative and innovative people."

UNITY TECHNOLOGIES

The development engine company has hired **RUTH ANN KEENE** as general counsel. She joins from Autodesk where she was VP, assistant general counsel and assistant secretary. At Unity, Keene will be in charge of the legal team.

CEO **JOHN RICCITIELLO** commented: "Ruth Ann's extensive experience and expertise make her a perfect fit for Unity."

CREATIVE ENGLAND

Former UK news editor at *GameSpot* **ROB CROSSLEY** has joined Creative England as head of games. Crossley was *Develop*'s online editor for over three years.

He commented: "I could not be more delighted to join Creative England as it looks to support and collaborate with the country's next generation of bold and brilliant games creators.

"We want to work with you, learn from you, and we want to support you."

BONFIRE STUDIOS

Former *World of Warcraft* lead designer **ROB PARDO** has launched Bonfire Studios.

Pardo spent over 16 years at Blizzard and poached some of his co-workers to create Bonfire. This includes VP of art and cinematic development **NICK CARPENTER**, *Diablo III* director **JOSH MOSQUEIRA**, and **MATTHEW VERSLUYS**, who worked on Battle.net.

PRODUCER OF THE MONTH

This month we speak to Lana Zgombic, associate producer at Chilled Mouse

How did you end up at Chilled Mouse?

I found out about the creative skillset trainee scheme, through a friend. A couple of weeks after applying I was contacted by my now-boss and after a couple of interviews I was offered a trainee job. I started working just two days after my graduation. After a year I was taken on as a full time employee and have been here since.

Describe your typical day.

There are quite a few things I do on a daily or weekly basis. Sometimes work can go slow and sometimes I stay overtime to finish tasks. Once I start something, I like to finish it and staying longer is never an issue.

I spend a good hour catching up on emails. I use a task-tracking app called TriggerApp so I can go over the tasks that I've set before and make sure I'm on track. Lunch break is generally spent watching cartoons. And the rest of the day is spent on the remainder of tasks.

As I work on multiple games at the same time I have to make sure I hit all of the deadlines and prioritise well. My favourite task is testing and breaking the games while they're in alpha or beta.

What are the biggest challenges you're facing on your current project?

The biggest challenges I've faced with all my projects have been marketing and pushing our games out to the world. It can be difficult if we start too late or haven't done enough. As a relatively new company, we've experimented with each project, approaching them in different ways. *Warhammer Quest* was released as a pre-purchase model and the brand gave us enough boost to rely on that. *Chime Sharp* had a great Kickstarter campaign and engaging Early Access, but not so successful marketing as it was a niche genre. *Torn Tales* is an RPG so it faces the difficulty of being one of the many RPGs on Steam but it was well received at events.

What advice would you give to an aspiring producer?

Reflect on whether this is something you really wish to do. Being a producer takes a lot of energy as you constantly have to engage with clients, consumers and your teammates.

Invest in yourself and your education. You will constantly learn new things about the processes and team communication. But most important of all: get enough sleep. ■

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“THE BAR TO WORK IN VR IS VERY HIGH”

Virtual reality is not a ‘trend’ anymore – it’s now alive, well and on the hunt for talented creators. **Marie Dealessandri** asks leading recruitment firms what lies ahead for the nascent sector as far as job opportunities are concerned and what it takes to become the next successful VR developer

With the imminent arrival of PlayStation VR, the number of VR studios looking to hire has gone through the roof.

Liz Prince, business manager at Amiqus says the biggest trend her team has seen over the last year has been a shift studios asking for ‘an interest’ in VR to only wanting candidates with demonstrable VR experience.

“This means that VR CVs receive premium attention because supply is not yet meeting demand,” she says.

“We are seeing approximately one VR role for every five regular roles. However, we have noticed an increase and we expect this to continue this year. Whether or not this will last into 2017 and beyond is hard to say.”

However, Guy DeRosa, games and interactive manager at Skillsearch Digital, believes this growth will be sustained: “We believe that Gartner’s Hype Cycle forecast of five to 10 years for full VR maturity is too pessimistic. We’ve staffed projects in development that are far more advanced than people might expect and, when released, will give the industry – and investors – a much clearer understanding of VR’s capabilities.”

HOW TO MAKE THE CUT

The fact that not many companies have actually delivered big VR projects yet is one of the only obstacles remaining as far as the job market is concerned.

“Most studios seem to be prototyping with the technology at the moment,” says OPM’s PR and marketing manager Nathan Adcock. “Not many companies are fully committing to big VR projects and are using just small teams within the studios to see what they put together. Because of this, there aren’t many jobs where a person is required to have VR experience – most people and their respective employers are learning this stuff on the job.”

VR experience is an added bonus for any studios who are playing with the technology.
Nathan Adcock

CVs with VR skills receive premium attention because supply is not yet meeting demand.
Liz Prince

Aardvark Swift MD Ian Goodall agrees that experience is not the primary focus of the open positions currently available on the market.

“VR is really booming at the moment, and we’re working with a lot of newly formed VR-focused studios in addition to existing clients who are actively taking on VR projects,” he says. “This means we’re getting a big influx of VR related roles across the board. Designers, creative leads, producers, artists and graphics programmers are the key roles often being sought out. Due to its relative infancy, few of these roles require much previous experience.”

Designers, creative leads, producers, artists and graphics programmers are often sought out.
Ian Goodall

We’ve staffed projects that will give a much clearer understanding of VR’s capabilities.
Guy DeRosa

While experience might not be the key requirement, a strong set of skills obviously remains a must-have.

“The skills needed for VR are the same as in the wider industry; C++, C#, Unity and, on the art side, Physics-Based Rendering,” Prince explains. “That said, there are enormous challenges when rendering within VR because of how fast and complex the images need to be to keep up with player movement. For this reason, we are finding the bar to work in VR is very high and only the highest quality portfolios make the cut.”

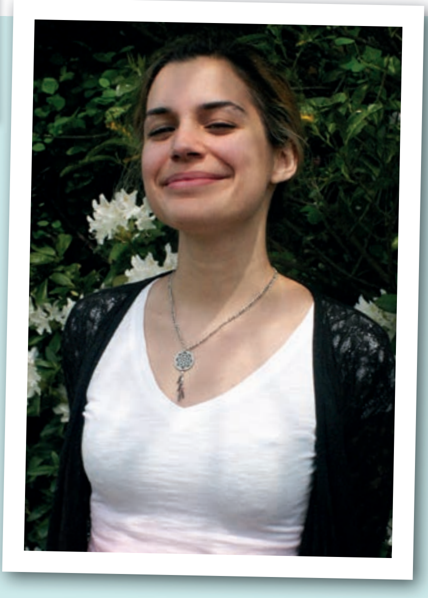
DeRosa adds: “Interactive VR shares similarities with the traditional game development cycle and requires developers with real-time game engine experience. Demand for technical game artists is also high, as is the need for 3D modellers. Designers and producers who have specifically researched or worked on interactive projects are a valuable rarity as interactive VR represents a unique set of design challenges that must be overcome.

“But then there’s VR ‘experiences’. This category is geared towards 360-degree videos where VFX and solid post-production talent is highly sought after. Such experiences are typically 360-degree images and videos stitched together using tools such as Nuke.

“Early adopters of VR are probably familiar with the technology, using Google Cardboard to create immersive tours or rollercoaster experiences. Critically, we expect to see this category gain more momentum as Facebook 360 and YouTube 360 gather steam with consumers.” ■

GET THAT **JOB**

This month: Software engineer with Playtonic's **Catarina Barros**



What is your job role?
I am a software engineer for Playtonic Games. My main job is to implement gameplay features and make sure everything is working smoothly. I work with the studios artists and designers to bring their ideas and creations to life with a bit of my own creativity added to the mix.

If you were interviewing someone, what do you look for?
If I was interviewing someone for a similar role, I'd be looking at the experience and skillset of the person but also their passion, ability to work well within a team and contribute to a good work environment. A passion for games, playing them, understanding them and making them. Having a positive and "can do" attitude is also something I value quite a lot, as that is a trait that has brought me this far in my career.

What qualifications and/or experience do you need?
If you want to be a software engineer, I would definitely recommend starting by getting a BSc in Computer Science or a similar subject. A good foundation in maths, physics and problem solving is also a must. Experience working with different tools and languages is also helpful, and a willingness to always learn more.

How would someone come to be in your position?
A good computer science degree is always a plus, but above all else you need a passion to make video games. That means not only playing them and wanting to understand how everything is done but to also work on your own projects and try and create your own ideas into something interactive that you can play.

> "You get to build games. What else could you ask for? You get to share your ideas with the world.
> *Catarina Barros, Playtonic.*

What opportunities are there for career progression?
There are quite a few opportunities to further your career in the industry. You can decide to be a generalist or specialise in one of the different areas (or more): gameplay, graphics, engine, audio, network, just naming a few. As you gain experience other positions such as lead, principle and software director roles also become a possibility, these entail a lot more responsibility as you'll be coordinating everyone's effort towards developing and delivering a quality product.

Why choose to follow a career in your field?
It's an incredibly rewarding and fulfilling career. You are presented with new challenges every day and you get to work with some really amazing people that share the same passion as you do. And if that isn't enough, you get to build video games. What else could you ask for? You get to share your ideas, work and passion with the world. ■

SKILLS AND **TRAINING**

This month: Robert Berry, CGMA programme leader at the University of Derby, talks about what his team has to offer to aspiring developers

Overview: The University of Derby offers a BA (Hons) degree in (CGMA) Computer Games Modelling and Animation and a BSc (Hons) Computer Games Programming (CGP).
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E: tech@derby.ac.uk
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The University of Derby's degree in Computer Games Modelling and Animation is aiming to use its staff's experience to help students get the best education, joining their BSc in Computer Games Programming.

"During a final year project, both courses collaborate on a game development module demonstrating all the skills students have developed during the course to produce a fully functioning game," explains CGMA's programme leader Robert Berry.

At the University of Derby, he works alongside veterans of the industry to ensure his students have the best experience possible.

"Every member of staff has a large network of industry links to the games and film industry (Disney, Gremlin, Core Design, Microsoft, Playground and Eurocom) developed during years of professional working experience," Berry says. "This industry experience stretches from before the PlayStation era all the way through to the Xbox One. It provides a range of expertise where old school techniques can blend, in harmony, with newer generations to maintain stunning visuals, whilst focusing on limitations."

This close link to the UK games industry is of course a tremendous advantage for the Uni's students, enabling year-long placements at Sumo Digital or Rare studios, to give recent examples.

Students at the university have access to the labs from 9am to 9pm, Berry adds. "The game labs are designed to emulate real world studios and are air conditioned. The layout encourages collaboration and are perfect for team projects. Specialist software, such as Maya, ZBrush 4R7 and Unreal Engine 4 is available in all computing labs. The hardware is regularly replaced with specs that are powerful enough to handle anything the students can imagine and develop."

The university also wants to make sure students don't lack soft skills that are essential to their future success in the workplace. .

"Peer mentoring is a very successful component of the programme this is open to all students in the second and third year through application. This increases confidence and develops soft skills desirable in the workplace, such as public speaking." ■

RECRUITER **HOT** SEAT

Global HR director Kevin Moore talks about Crytek's international team and how the firm offers relocation support for the talents coming from all around the world to work with the studio

What differentiates your studio from other developers?

Crytek is not only a fantastic game developer and publisher, but we are also a leading game technology company in that we use our CryEngine for all of our game productions. CryEngine is also licensed by many other game studios around the world to create great gaming experiences. Crytek has received over 170 awards from independent organisations for its games but also as a popular employer.

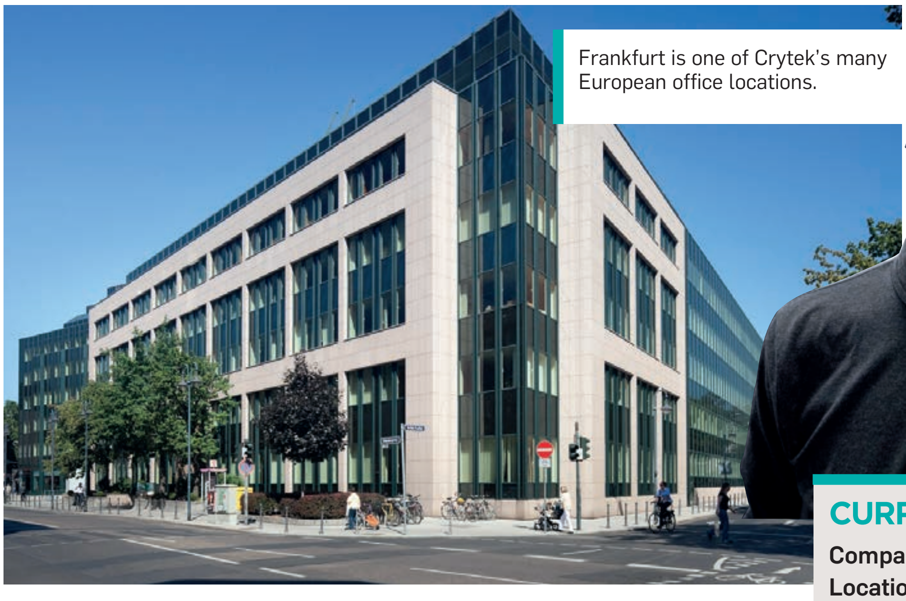
How many staff are you looking to take on?

We are always looking for top talents from around the world to stay competitive. Our hiring needs are based on our current projects and at the moment we are looking to fill over 60 open positions, which you can find on our website.

What perks are available to working at your studio?

We can offer a lot, starting with a refreshing and creative atmosphere in an international team with over 40 nationalities represented. Flexible working hours, continuous training and a personal development plan are among the perks as well as health insurance and free gym membership. On top of this we offer a 24/7 free public transportation ticket, a great onboarding program to integrate the employees and to set them up for a successful career at Crytek.

Many join our team from foreign countries and we assist them in getting a visa and work permits, as well as relocation support including a company apartment for their first three months here, and if necessary we assist in finding a private apartment thereafter. Regular events are a year-long tradition. The studio language is English but because we're located in Germany, we offer German and English lessons for our employees and their partner or spouse.



Frankfurt is one of Crytek's many European office locations.

CURRENTLY HIRING

Company: Crytek
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Hiring: Over 60 open positions comprising various artist, engineer and programmer positions (including VR programmers)
Where to apply:
www.crytek.com/career

What should aspiring devs do with their CV to get an interview with you?

Impress us. Show us what you can do from your previous work and how it fits to the position.

What advice would you give for a successful interview at your studio?

Be authentic, be prepared, impress us with what you have done so far, be positive and be passionate.

Who is the best interviewee you have ever had and how did they impress you?

The best are people who were very informed about Crytek concerning what we do and how we do everything. They also impressed by interacting very well with the people in the team and they could show us how they best fit for the position.

> Our hiring needs are based on our current projects. We are looking to fill over 60 positions.
>
> *Kevin Moore*

And who was the worst?

Just the opposite. If people do not inform themselves prior to an interview and know nothing about who we are or what we do, they usually don't make it very far. Interviewees who obviously can't get along with the team when they get to meet them will have a hard time being hired, too.

What is the international recruitment process like?

When we first get in touch with the candidates, we ask them about their relevant know-how concerning the position and we talk about their future perspective with Crytek. After this we usually invite potential candidates to meet the team they will be working with and see how they work together. Candidates can also familiarise themselves with the city they might move to. We then take into account their relocation needs, family onboarding, training and their benefits should they come to Crytek. If we see a win-win situation, they are hired.

Why should developers join you when indie and self-publishing have become so much more accessible?

At Crytek you have the chance to work with very talented people who have proven their abilities in delivering high quality and high fidelity games. Young developers have the chance to learn from veterans with years of experience. At Crytek you can be part of games made for the international market and work with leading edge technologies like CryEngine and virtual reality for different game platforms on a daily basis. ■

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ALL YOU NEED IS GLOVE
We talk to two of the developers working to make VR Gloves a reality
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SOUND ADVICE

Virtual reality requires developers to rethink the way they tackle audio design in games. Positional and diegetic sound needs new tools and an extra layer of precision. **Develop** investigates

With the rise of virtual reality comes fresh innovations in practically every area of games development. New perspectives, visuals and ways to interact with game environments are headline grabbers, but it's audio designers who are experiencing the biggest change since the invention of surround sound.

The move from traditional games to VR is as large a jump for sound designers as the shift from 2D for 3D was for graphics artists back in the '90s. In fact, it's a very similar situation with a literal new dimension giving artists new opportunities.

Suddenly, sound and music has the potential to very easily ruin a player's experience with a game by shattering the sense of immersion key to the enjoyment of virtual reality.

"Audio plays a crucial role because, as the synchronous counterpart to the visuals, it delivers half of the VR experience," says Audiokinetic's Jacques Deveau. "Poorly implemented audio can quickly break the virtual reality experience."

Michalis Mavronas, audio producer at *Radial-G* creator Tammeka Games, agrees: "It is important that audio design is now given the same attention as any other element in a production. Any 'traditional' audio design approach in VR will work but can limit immersion or confuse the sense of presence in the game world."

Where once audio could stand alone within a game, it now requires cohesion with the visuals to maintain immersion. Suspension of disbelief falls away as developers now have to trick the brain directly.

> **A common misconception is that virtual reality implies simulation, but this is not the case.**
> *Joe Thwaites, Sony*

"The mantra that 'audio is strongest when every discipline is working together to tell the same story' is so important in VR experiences," claims Steve Brown, audio director at *Until Dawn: Rush of Blood* dev Supermassive Games.

"For a long time, audio professionals have pushed the agenda that sound can be 50 per cent of the experience. It's a figure all game audio designers want to hit. Audio that not only enforces gameplay messaging, but is impactful and makes the world believable and beautiful. Most importantly, it can add huge emotional weight to the actions in the worlds [players] are inhabiting.”

GET IN POSITION

The best way to keep players immersed in your virtual world is to utilise positional audio. Virtual reality adds a third dimension to a game's soundscape, where previously there was only a flat plane.

“Sound needs to come from the direction in the virtual setting that it is originating from,” says Iwan De Kuijper, director of creative entertainment at audio middleware provider Auro. “Our ears are smart, and if a sound is meant to be coming from above and a user isn't able to aptly discern that origination point, we pick up on that. Any negative attention that is brought to sound design during gameplay will break immersion. It's when you don't notice it, that's where it shines.

“The biggest difference is that in VR, every object has to emit sound – 2D ambiance won't work anymore. In fact, it'll break immersion, in turn interrupting the gameplay and making for an overall lesser experience.”

This potential problem comes from a more deeply connected experience intrinsic to virtual reality.

“We are no longer a remote viewer interacting with a mouse and a screen,” says Mavronas. “We are positioned within the game world. This means that sound designers need to place their sound sources more accurately in relation to the player's position and relate the visual object with its sound more closely.”

> **“Audio will need to be approached more as a localised simulation.**
> *Michalis Mavronas, Tammeka*

Deveau explains this from a development perspective: “Since the player can view all in 360 degrees, care and attention to audio detail is critical to making a immersive experience. Audio ‘level of detail’ provides both artistic and technical challenges in VR.

“For example, a fire burning in a fireplace. In a non-VR implementation, the sound designer could probably get away with sounds playing from a single emitter placed in the centre of the fire. In VR, the sound designer would need to position individual sound emitters for the low burning rumble, the fire and the crackling, each at different vertical points on the fire. Different roll off/attenuation curves would also be needed for added realism.

“This more detailed approach to audio and implementation creates more demand on the sound designer.”

DELIGHTFULLY DIEGETIC

With new technology comes new buzzwords, and audiophiles are talking about ‘diegetic sound’: audio from a visible source. This is vital in virtual reality to prevent that disconnect for gamers and means ambient sound and music is much less effective when the player has full 3D freedom of movement.

Mavronas explains, “Instead of having an information announcement for a racing game coming from an arbitrary source, we can now place it within our immediate environment or even simulate it as if through the driver's headphones. Audio will need to be approached more as a localised simulation rather than just an audio representation of an object appearing on a screen.”

This might sound like a huge amount of extra work and expense in terms of man hours but that's not necessarily the case.

“I do think for first-person viewpoints positional audio is an essential part of the experience,” says NDreams' Matt Simmonds. “And there are a lot of different plugins to help out with that.

“If everything needs to be full 3D audio though, it really depends on the project and what your target hardware can afford. A game from a distant viewpoint with only a small budget could utilise it in focusing measure, pinpointing areas the player should be looking towards but keeping the rest of the audio in the normal stereo headspace.”

For larger projects, extra audio information can create an even more vivid illusion. Positional audio gives players a sense of place in the world,

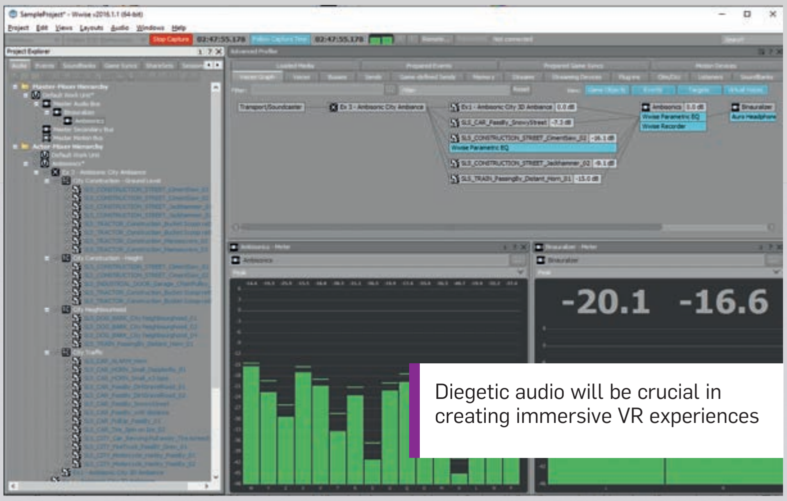
but bouncing sound and acoustics can describe an environment before they even see it.

“As humans, we are hard-wired to accept auditory information, which our brain uses to determine where a sound is coming from,” says VisiSonics’ Ramani Duraiswami. “Also, details on the surrounding environment, whether a space is large, small, or open, or whether you are in a corner.

“Early and late reflections are critical cues that provide information about environments we’re in. The most accurate way to create these is to use physics-based algorithms that approximate how sounds bounce around and how the material properties affect the reflections to let us know if a space is absorptive or reflective.

“For example, a carpeted room vs an underground garage. What’s critical is that the reflections themselves must also be rendered in 3D; traditional reverbs are 2D and only simulate reflections in the horizontal plane.”

But with diegetic sound comes a new expectation from the player; all sounds that can be heard within the VR experience must have a visible, discoverable source. Failing to do this could break the immersion.



Diegetic audio will be crucial in creating immersive VR experiences

“For example, you are in a back garden of a house,” explains Brown. “You hear a beautiful robin behind you in the tree. Due to clever binaural processing it feels behind you and you are drawn to it to discover what it is. You turn around and there’s nothing there and the sound continues. Where is that bird? Did they not render it? Did they even make it? Why is there even a sound?”

TRACKING SOUNDTRACKS

This causes difficulties when it comes to music. Developers will need to come up with ways to insert music in a way that doesn’t break immersion.

Joe Thwaites, senior composer and music producer at Sony, says: “A common misconception is that virtual reality implies simulation, throwing up concerns that non-diegetic music is no longer relevant, but this is not the case.

“The important difference we have found when working with VR is making sure you know what the function of your music is, because it might affect how best to implement it. Music can draw you into the story whilst bad music can make you step back. This works the same way for VR only the step back is far bigger.”

Typically while a music track is playing, the chances of a disconnect between the player and the world is much smaller than points at which music begins or ends. The trick is to sneak music into your environment without anyone noticing.

TIPS FROM THE TOP

As with many areas of VR development, there’s no best practice in place. Developers are all learning together as they wade waist-deep into this new technology.

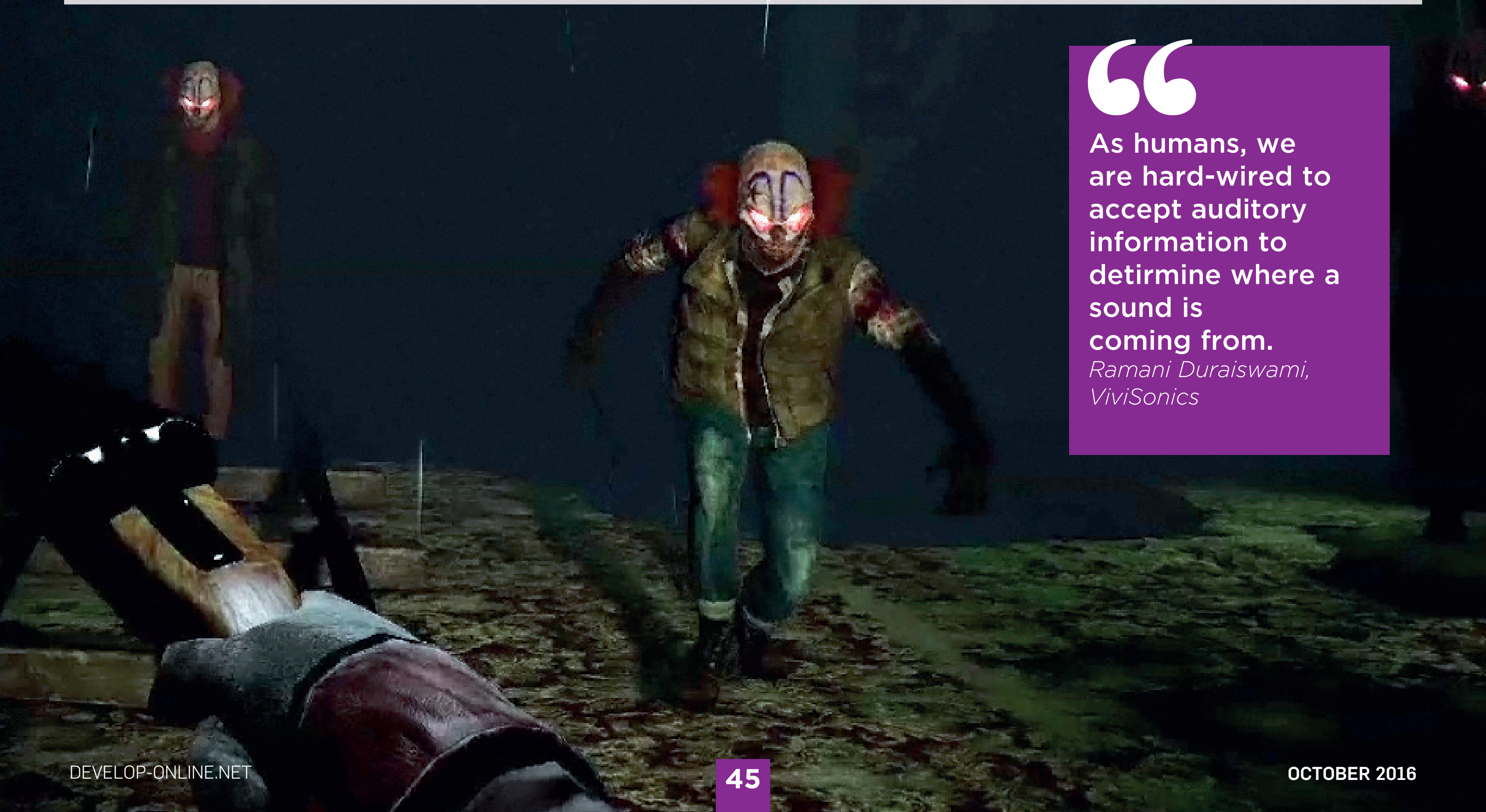
“My advice would be to experiment as much as possible,” says Thwaites. “Nothing is set in stone and there’s still much more to be learnt.”

There are some 3D audio middleware providers, like Auro 3D and VisiSonics’ RealSpace 3D Audio. De Kuijper says that Auro “doesn’t want to reinvent the wheel entirely”.

“Doing so will break productivity and leave developers less open to innovation, ” he explains. “It’s why we partnered with Audiokinetic to integrate Auro-3D, our immersive audio format, into the Wwise engine. Currently it is available for free on their website as a limited time offer.”

VisiSonics’ Mike Henein calls a good 3D sound engine “required”, as it gives developers freedom to experiment with positional and diegetic audio without having to code from scratch.

“With a 3D audio engine, such as RealSpace3D you get bang for your CPU buck, and can get significantly



As humans, we are hard-wired to accept auditory information to detirmine where a sound is coming from.
Ramani Duraiswami, ViviSonics

Game engines are catering more and more towards game creators looking to step into the unknown of virtual reality development. **Develop** investigates how developing in VR can be a form of play in itself

CREATING IS **PLAYING**

Middleware developers across the industry are embracing virtual reality by building new tools and workflows into their engines to aid VR game creation. With an explosion of devices hitting the market and consumer interest at an all-time high, an easy to use, cross-platform engine is the easiest way for game developers to quickly get their latest creations beamed into the eyes of as many VR gamers as possible.

Allowing developers to swiftly and easily create games for the growing myriad of VR headsets available is a necessary feature for third-party engines. It can mitigate risk by letting the developers reach the biggest possible audience with the minimum amount of additional dev time. It's not only the headsets that need to be accounted for, but also a variety of input methods such as motion controllers, gamepads and joysticks.

Hao Chen, the senior principal software engineer for Amazon's middleware solution Lumberyard, suggests that a modular approach allows for maximum flexibility.

"We make it easy for programmers to support more VR devices and create custom features," he says. "All of Lumberyard's VR functionality is wrapped around modular plugins, which we call Gems. The engine is all written in modular ways so swapping out functionality and adding new features is clean. We also provide an abstraction layer for VR inputs so code will work on all input devices."

The danger of betting on a single piece of virtual reality hardware is a very real one, and could put developers off creating games for VR.

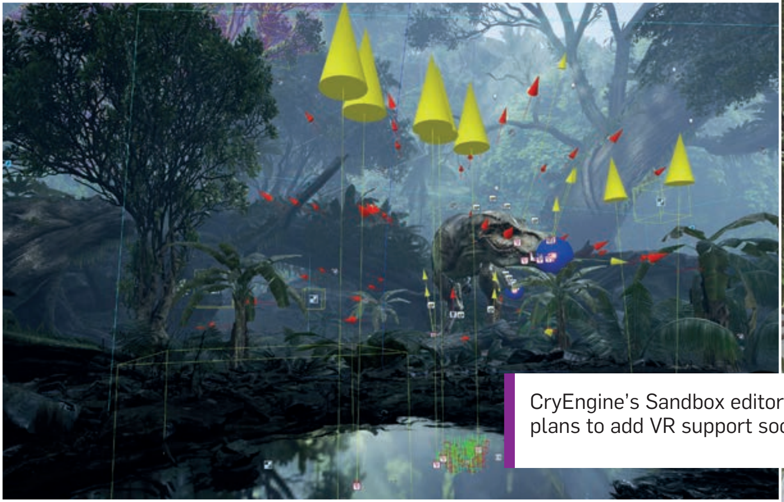
Corey Johnson, technical product manager at Unity, feels developers should focus on being creative, not trying to guess what will succeed.

"The industry's in such an experimental phase," he says. "We think it's in every developer's best interest to be on as many platforms as possible. We help ensure your investment is in creation, not technology that might become obsolete. Every developer wants to target the widest number of consumers. We'll help you reach them all, with minimal changes to the codebase."

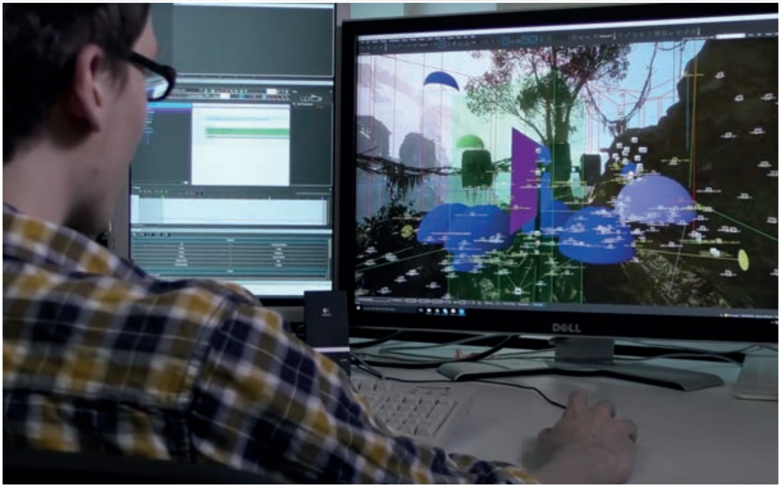
> **"At GDC, we built our VR demo using only Flow Graph. Not a single line of code was needed.**
> *Hao Chen*

CONSISTENCY IS KEY

Creating games for a variety of VR platforms is fine, but unless you can keep a consistently high framerate on all devices, you could have a number of very uncomfortable players on your hands.



CryEngine's Sandbox editor has plans to add VR support soon.



"Devs need to balance visuals and performance requirements to hit a minimum frame rate, to be sure players remain comfortable in the experience," says Frank Delise, Autodesk's senior director of interactive entertainment.

"Developers sometimes look at 30fps or 60fps for console or PC games. With VR, we're looking at 90fps and any dip can cause almost instant discomfort. If a player doesn't feel comfortable, they may stop playing the game or worse, feel physically ill.

"The biggest gains can be found by making assets efficiently. Autodesk has tools specifically for optimising environments and characters."

Nick Whiting, Epic Games' technical director for VR and AR, adds: "The key to a compelling experience relies on flawless execution of many different parts. If you fail at any one, you risk making users queasy at best, or seriously injuring them at worst.

"Engines ensure devs don't have to worry about a lot of the technical concerns. We spend a lot of time making sure that latency is minimised, and that the rendering is optimised for the high performance requirements of VR.

"We as an industry were just getting used to rendering at 1920x1080 at 60fps. Now with VR, we have to render at 2160x1200, oversampled by over 130 per cent, at 90 frames per second. It's the engine's responsibility to make that jump as easy as possible. The developer still has to use their own bag of tricks, but we need to help them as much as possible."

CryEngine's creative director Frank Vitz elaborates on how important the optimisation of your game level is, stressing that it requires far more than conventional video games.

"The engine needs to include examples of how to create lightweight assets that look good while being efficient," he says. "It also must provide performance measuring and profiling tools so that users can figure out what the cost trade-offs are."

Trade-offs are at the forefront of engine providers' considerations when it comes to enhancing their software for VR. Whiting says the Epic team is still debating what to focus on in order to give developers more options in how they ensure their VR games' performance is consistent.

"One of the changes that we're focusing on now is offering the choice between a deferred and a forward renderer," he says. "Different applications will want to make different trade-offs, and by providing both paths, developers will have much more choice in the way that they build content.

"With forward rendering, VR developers can take advantage of multi-sample anti-aliasing. With deferred, VR developers get access to the widest variety of features, and access to the G-Buffer. We leveraged the G-Buffers in *Bullet Train* to do the reflections, and faking the dynamic lights in the train.

"It's really up to the developer to decide which trade-offs are right for their project."

Equally important is making sure that coders, artists and designers can iterate on their ideas quickly in the engines themselves. Autodesk's own game engine, Stingray, attempts to bridge the gap between art production and getting assets in game.

"We want to help people with great ideas focus on the art and design of their games without worrying about how to make tools work," says Delise. "This means adding export options like 'send to Unity' and 'send to Unreal,' making the art-to-engine process much simpler.

"We recently added special scripting nodes that let designers add controller interactivity for the HTC Vive, so they don't have to write code. Making the technical process easier in ways like this helps more creative people bring their ideas to more players."

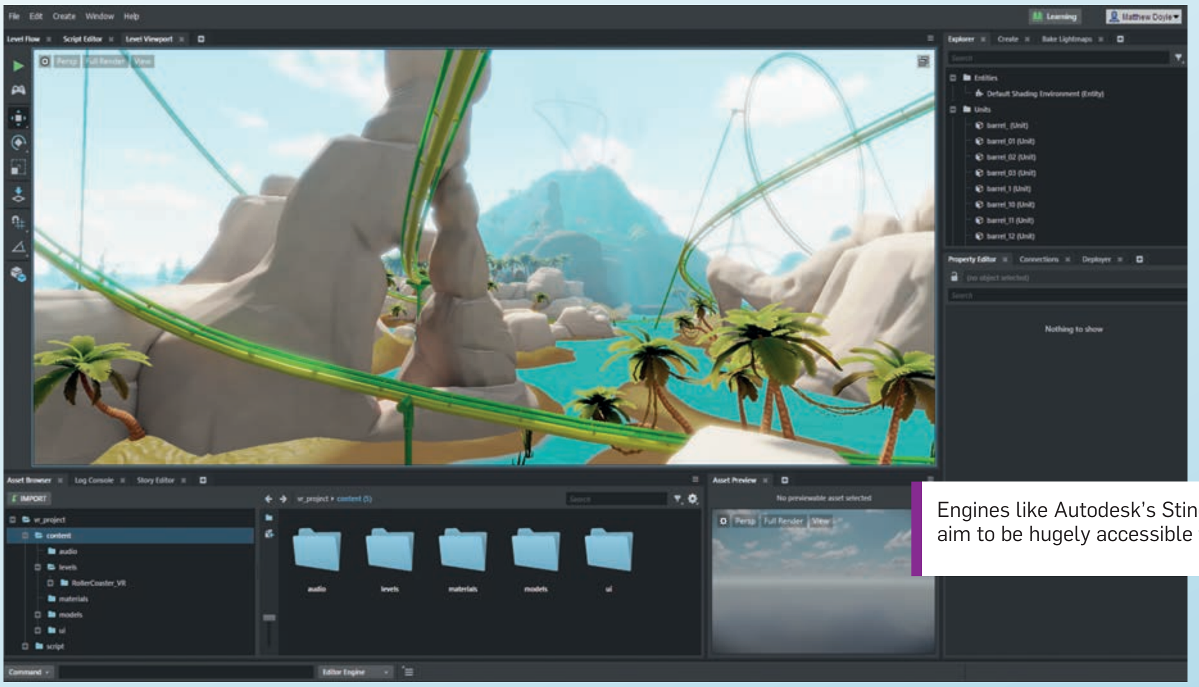
This friendliness towards non-programmers is mirrored in Lumberyard, which also has visual scripting features that allow for fully codeless development.

"We plumbed our visual scripting component, Flow Graph with VR-specific functionality." says Chen. "At GDC last year, we built our VR demo using only Flow Graph; not a single line of C++ code was needed to create the whole experience."

The nascent nature of virtual reality means prototyping is imperative if devs want to hone their concepts but ensure comfort for their players. As such, Whiting says engines need to be geared towards rapid iteration.

"VR is full of unsolved problems on the design side. We know the value of iteration," he says. "Things that we thought would be obvious wins often end up being great mistakes, and vice versa. Therefore, we put a premium on being able to try ideas, and fail fast.

"Our Blueprints visual scripting system lets anyone on the team write behaviours and prototype ideas, not just programmers. If an animator or a designer has an idea, they should be empowered to try it out. It means great ideas can come from anywhere and we can try as many as possible without losing too much time. That's vital when exploring new ground, as we do every day in VR."



Engines like Autodesk's Stingray aim to be hugely accessible to all.

IMMERSIVE TOOLS

Unity is pushing this idea even further with the invention of EditorVR, a fully immersive development environment that allows creators to do what they do best in a more efficient, tactile way.

"We're continuously developing new tools and standard assets, like EditorVR, that will make the process of designing, prototyping and experimenting much faster, especially for those without advanced programming skills," says Unity's Corey Johnson.

Epic Games also launched VR functionality for Unreal Engine earlier this year, enabling devs to construct environments and access the majority of the toolset's functionality while using a HMD. In this way, developers are making the creation of games an act of play, plunging artists and designers into the centre of their own worlds and instantly seeing how the player will perceive the game.

It seems these features will eventually be ubiquitous across VR-supporting engines. Vitz says: "It's a lot of fun to be able to grab things and move them around in VR. The nature of the immersive 3D world makes operations like that feel intuitive and natural when they are done right.

"We plan to fold VR support into CryEngine's Sandbox editor. We want the VR experience to fit and be as seamless and useful as possible."

Chen doesn't outright say that an in-VR editor is coming to Lumberyard, but if enough developers want it, then it's something that could be prioritised for future updates.

"Our philosophy is to listen our customers and work on the features they find most critical," he says. "A few things might be better in VR - for example, navigating the 3D space, seeing things in context, moving objects around to get them just right, snapping pieces together, and so on. Everyone is still experimenting and trying to find the right way to build great VR experiences."

According to Timoni West, principal designer at Unity, developers that have tried EditorVR have responded very favourably to it.

"Our goal is to keep creators in the headset as long as possible, making real environment changes directly. To this end, we include the inspector, project view and a host of other useful tools. Most importantly, you can make changes to your scene and save directly in VR."

With middleware and game developers evolving and learning alongside one another, growth and experimentation within this new medium is all but assured. Newcomers and established game creators already have wide choices for producing their VR masterpieces. ■

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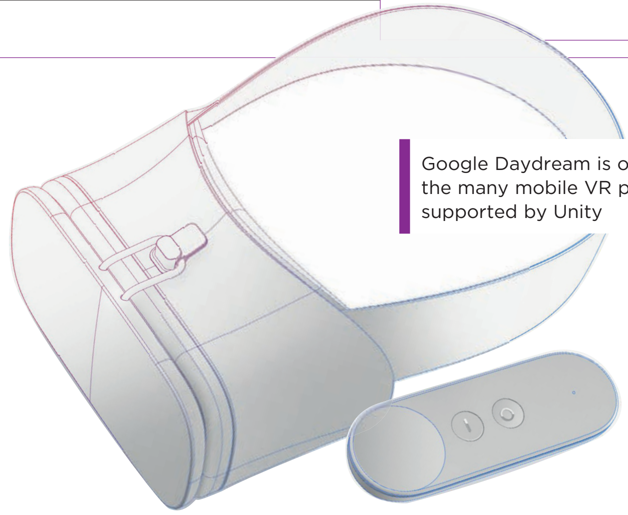
DIVING INTO DAYDREAM WITH **UNITY**



Google Daydream is one of the many mobile VR platforms supported by Unity

Scott Flynn, Unity's director of VR and AR development, discusses how the firm is embracing Google's newest tech

We're bullish about mobile VR – it's a democratising form of virtual reality, with the potential for mass market reach a few years from now.

It's a sheer numbers game: with an install base of around 3bn in 2016, mobile devices are already dwarfing the 1.5bn PC base. Any developer targeting VR and craving distribution and discovery should absolutely consider mobile.

Unity's strategy has long been focused on letting developers create once and publish everywhere. It's a critical consideration for a rapidly changing market like this one where no one device is a clear winner. With Unity you can be confident your investment of time and creativity is well-represented across all platforms, whether the dominant market leader is GearVR, Cardboard or Daydream. And we think it's this approach that's going to get our industry a few steps closer to narrowing the content gap between platforms.

THE GOOGLE OPPORTUNITY

Google Daydream is the latest addition to Unity's list of target platforms, but it's also apretty exciting one. Just last month we announced native Daydream support, with a streamlined workflow, significant optimisations and reduced latency. We've leveraged the platform's asynchronous reprojection and VR performance mode and tested these modes for longer sustained experiences. There's more things Daydream can bring with new features that carry really interesting implications for developers.

You could consider Daydream an evolutionary step for mobile VR, with its introduction of 3DOF motion controllers. A lot of developers are familiar with the notion of 3DOF – using controllers to pitch, yaw and roll. This provides for a new breadth and depth of content for mobile VR. You're no longer limited to gaze-based or "point and click" controls. You can now simulate swinging a bat or a tennis racket, and you can imagine how the portability could invite some new use cases, too. If you're looking for inspiration, take a look at the Daydream Controller Playground demos made in Unity.

WHAT'S NEXT?

Unity will continue to invest in emerging technologies to push VR and AR forward. From Vulkan and DX12 to accelerating developer creations with improved workflow and tooling. The number of VR devices continues to grow but one thing is certain - they just keep getting better and with Unity the games can run on all of them. ■

MADE WITH UNITY

More than 1,600 attendees will flock to Los Angeles between November 1st to 3rd for the Unite worldwide developer conference for three days of learning, networking and training.

One highlight is the Made With Unity showcase, featuring more than 40 new and soon-to-release games with developers on hand to share their projects and discuss their development practice with peers, attendees, and journalists.

On display are games from large studio mobile projects to single-person studio desktop as well as console projects, and immersive VR experiences, including:

- *Narcosis*, by Honor Code. for Oculus Rift, others TBC
- *Headmaster*, by Frame Interactive for Playstation VR
- *Vox Machinae*, by Space Bullet Dynamics Corporation for Oculus, HTC Vive
- *Sequenced* by Apelab for Oculus, HTC Vive, Gear VR, Google Cardboard
- *I Expect you to Die* by Schell Games for Oculus Rift
- *Cosmic Trip* by Funktronic

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UNREAL 4.13 ENHANCES VR DEVELOPMENT

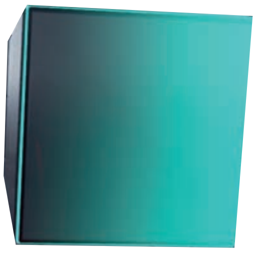
A slew of new features allow developers to unleash their potential with the power of Unreal Engine.

The release of Unreal Engine 4.13 in early September has brought a variety of all-new features and enhancements to the powerful game engine that are expanding developer options.

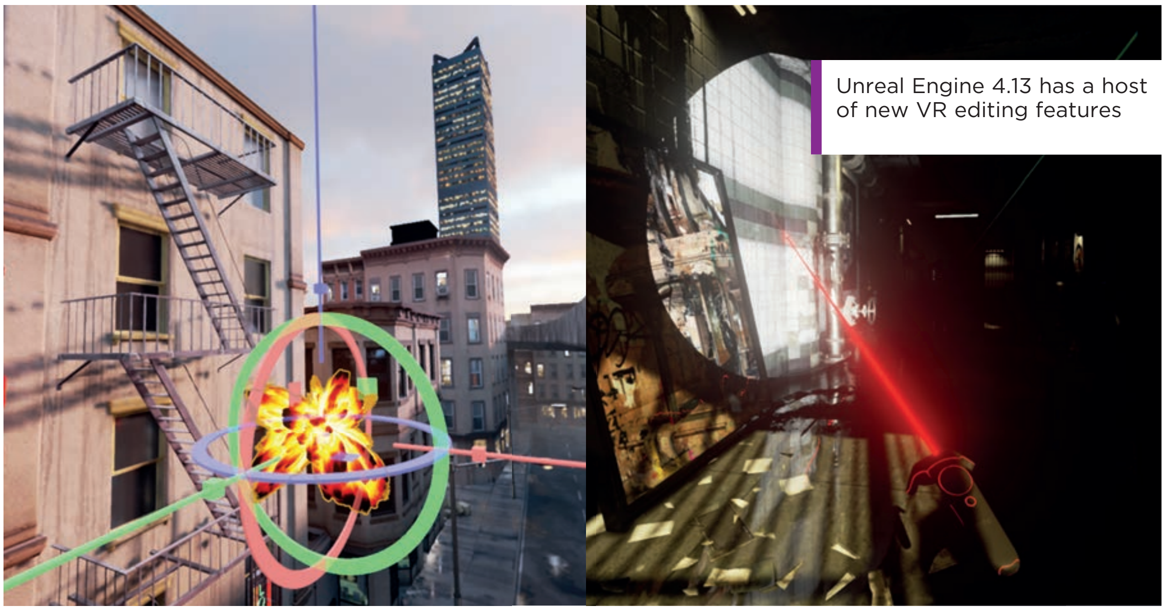
These include huge additions such as Sequencer import and export functionality, Alembic support for complex vertex animations, blend space functionality for bone poses. There is also the latest SDK support for Vulkan, Xbox One, PS4, Oculus, SteamVR, Google VR, OSVR, Android services such as Google Play, plus iOS and tvOS.

As many developers have already discovered, there has never been a more exciting time to be involved with virtual reality. With hardware finally catching up to our imaginations and Unreal Engine providing powerful tools for content creation, developers can now bring their VR visions to new heights. Of course, Unreal Engine is always evolving and some VR-specific features released in 4.13 have made virtual reality development more efficient and effective than ever before.

You can now paint on textures and mesh vertices while using the VR Editor. This allows you to use motion controllers to paint on static meshes whilst using VR. Pressure sensitivity is supported on your controller's trigger, and you can hold the 'Modifier' button to erase instead of paint. You can also now use motion controllers to spray down foliage instances while in VR.



Flexibility is key, which is why the Colour Picker window is now available in VR. This allows you to change colour properties on lights and other Actors in your level and select colours for Vertex Painting and Texture Painting in VR.



Unreal Engine 4.13 has a host of new VR editing features

EVERYTHING VR

To easily prototype your project, it is now possible to play your game in VR from within the VR Editor. Press the "Play" button on the quick menu to start playing in VR. To instantly go back to the VR Editor, hold the Grip buttons on both controllers and squeeze both trigger buttons.

You can now enter and leave VR editing mode when the VR editor is enabled without having to use the VR button or escape manually. As long as the editor is in the foreground, when you wear the headset, you will automatically enter VR editing mode; when you remove the headset, you will leave it. Translating and rotating objects feels much more natural, and you can now uniformly scale objects or translate them along a single 2D plane in VR.

There have been a number of improvements to instanced stereo rendering too, including moving the velocity pass to use instanced stereo rendering. Multi-view support has also been enabled on the PlayStation 4, which leads to significant performance improvements when rendering using the ISR path.

Lastly, you can now add a flashlight to your controller to light up dark parts of your scene or see how light interacts with different Materials. You can even take screenshots right from inside the VR environment to share your amazing projects as they progress.

GET GOING

In 4.13, a new VR template has also been added with settings optimised to run in VR at 90 frames per second and out-of-the-box implementation of VR gameplay features. The template includes two methods of locomotion designed for gamepads and motion controllers. With motion controllers, you can teleport to different locations and grab and throw objects.

Those are several of the updates that developers can now enjoy. Unreal Engine 4.13 is available for free and can be downloaded anytime at UnrealEngine.com. Each new release brings exciting additions and enhancements that deliver powerful tools directly to developers hands. Follow @UnrealEngine on Twitter to see the community's projects in action and to share your work with developers around the world. ■

VISIT EPIC AT THESE VR EVENTS

■ **Oculus Connect 3**
October 5th-7th
San Jose, California

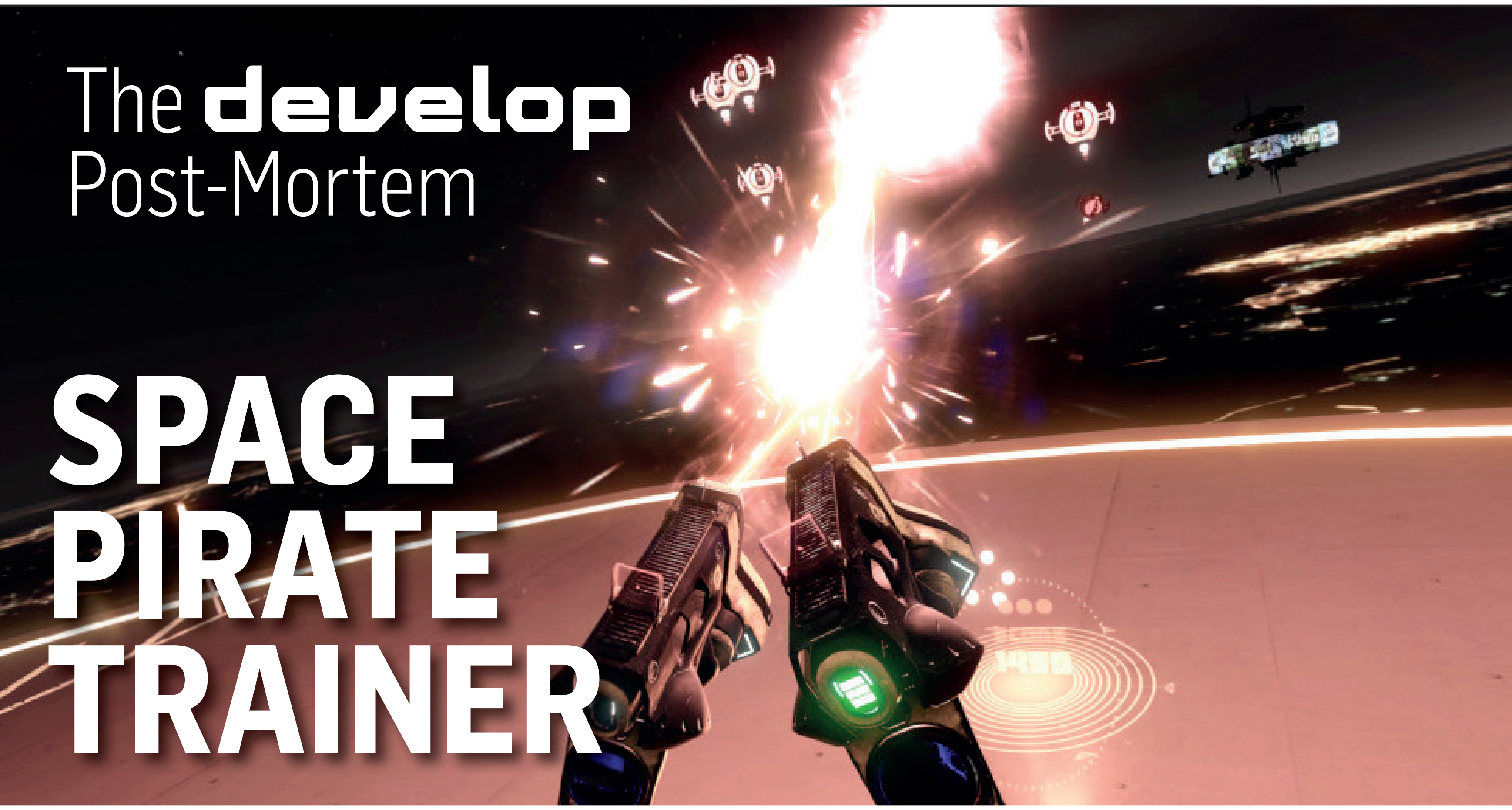
■ **Proto Awards**
October 8th
Los Angeles, California

■ **Steam Dev Days**
Seattle, Washington
October 12th-14th

■ **VR on the Lot**
October 13th-14th
Los Angeles, California

■ **VRTGO**
November 9th
Newcastle

■ **VRX**
December 7th-8th
San Francisco



The **develop** Post-Mortem

SPACE PIRATE TRAINER

Still in Early Access, I-Illusions' sci-fi shooter is already one of the highest rated virtual reality titles on the market. We caught up with Dirk Van Welden to learn more about the game's inception

Where did the inspiration for Space Pirate Trainer come from?

Back in October 2015, when I received a prototype of the Vive, it only had a handful of demos. All of them were beautiful or very good tech demos, but there was no real action in there.

Being inside of room-scale VR for the first time reminded me of those classic arcade machines that I used to play when there was a fair in the neighbourhood. I decided I wanted to shoot lasers at droids like in *Galaga*, and dodge bullets like Neo, because you can be anyone in virtual reality. Feeling like a superhero or villain is great, and VR can make that happen.

Arcades drop you inside of the action right away, and the difficulty curve is designed to let you survive a few rounds at least. I learned from those lessons and tried recreating that experience with *Space Pirate Trainer*.

Why focus on room-scale VR? Did this not limit what you could do with the game, or did it open new creative opportunities?

Positional tracking was always something I thought that was missing in VR. It is also the reason why I got sick most of the time when I trying out previous prototypes of other HMDs. Some of the tech demos that were included with the headset made good use of that room-scale feature, but only some of them were using it as a core game mechanic.

In the first prototype of *Space Pirate Trainer*, there was no shield or bullet-time at all. You just had to run around like a madman to avoid all that incoming fire. The movement and shooting of the droids is designed in such a way that you actually have to move to stand a chance.

> “Keeping a game interesting is all about keeping the player challenged.
> *Dirk Van Welden*

Every VR setup will be in rooms of different sizes. Playing around with these limitations made me implement bullet-time and the shield. Dodging was still a fun mechanic, but you could play it in smaller areas as well.

How do you keep the game interesting when it's based around waves of enemies?

Keeping a game interesting is all about keeping the player challenged. In the first prototype we had a totally procedural setup. A great benefit of that is that the difficulty curve is almost linear and you can even adjust it in real-time. But since *Space Pirate Trainer* is a score-based game, adjusting difficulty depending on the skill of the player was a no-go.

We created our own algorithm for the difficulty of the waves and manually wrote the recipe of all the different waves, which ultimately was a lot more interesting.

How long do you expect play sessions to last? Did this affect the way the game was designed?

Since *SPT* was always designed as a pick-up-and-play kind of game, and to be used in a lot of 'first-time VR experiences', we did not want to let the first plays last too long. Initially, the game only lasts for about a minute.

The moment players figure out the dodging and sound-cues, they usually survive for a few minutes. Every time you play, the droids behave in a different way based on certain parameters. That's one of the reasons *SPT* keeps its players' interest.

The biggest issue we had were the skilled players. Once they had mastered the gameplay, they would usually play very long sessions and the difficulty wasn't going up fast enough. We solved that by decreasing the bullet time effect a tiny bit every wave and ramping up the difficulty in a non-linear way.

How do you make a game intuitive, in terms of the controls and the way in which players need to move around?

If you make something that works the same way as it would in real-life, there's not so much explaining to do. To make people actually move in a VR world, they have to feel and prepare for the menace.

The droids charge up first – they light up when firing – and bullet-time kicks in when the laser is close. So we're speaking about three cues that prepare the player for moving out of the way before he or she actually needs to. When there's a glowing laser just a few meters away from your face, most people tend to avoid it.

What was the biggest technical challenge, and how did you overcome it?

Optimisation. *Space Pirate Trainer* is an arcade shooter and needs that 90fps as much as possible. Rendering something in VR requires much more GPU resources because of the wide angle and resolution. A lot of fancy details and shaders were removed or replaced by less GPU-consuming ones.

Also, testing out stuff isn't super convenient either. The helmet is constantly going on and off your head, you play around with the controllers, record some frame data, and search for samples that are off. We're able to do most of the tests on our desktop, but sometimes actually attaching the HMD introduces new slowdown or bugs.

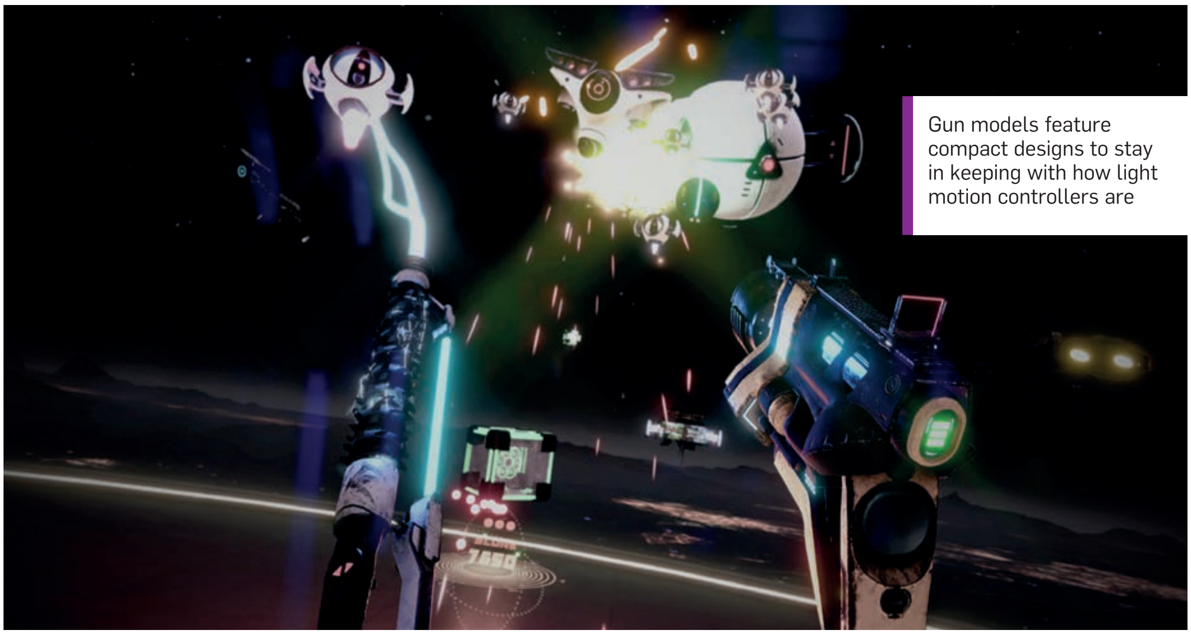
Here's another example of optimisation: the environment used to be fully 3D. All the details in the background are rendered on a spherical map that replaces all of that geometry.

The droids were optimised to use as few draw-calls as possible, since we need to render a huge amount of them. We use light-probes and almost no pixel-lights.

We also use some tricks to have HDR-like effects without actually using HDR. We're currently working together with GPU brands to get some VR-specific optimisations in there; it remains one of our top priorities.

What tech are you using? What's powering the game?

The main tech behind *Space Pirate Trainer* is Unity. I've been using it for almost 10 years now. We use the SteamVR and Steamworks.net plugins and Shader Forge as our shading tool. Most of the modelling and animation is done in Cinema 4D and LightWave, while we mainly use Substance Painter for texturing.



Gun models feature compact designs to stay in keeping with how light motion controllers are

How did you make the weapons enjoyable and intuitive to use?

When scale or feel is off you can see it immediately in VR, which is why we try to have our HMD on as much as possible while developing a VR game.

Since the controllers aren't very heavy, we tried to keep the gun models as compact as possible. We have spent a lot of work on force feedback as well. It's subtle and most users don't even notice it at first, but it adds more punch to the overall experience than people would think. We use the controller-input data as raw as possible. I love games that react quickly and without any delay.

The only area where we had to cheat was the Railgun. It is a charge gun, so shooting it requires you to release the trigger. Because the controllers aren't heavy, even that tiny movement makes the gun rotate just enough to miss your target.

We solved that by "locking" the target for a few milliseconds, when your gun is still fewer than X degrees off. I removed this as a test in our private beta, and got a lot of complaints that the charge gun wasn't working well anymore.

Shooting with a controller is a lot different to shooting with a mouse, which introduced many opportunities and problems. Most people already know that we've made the gunbarrel angle editable. This was a community request, due to the fact that the controllers don't have the same angle as real guns, and those vary as well.

What advice would you give a developer that is tackling VR for the first time?

The main thing I would tell them is to spend as much time as possible in VR during development. Try to look for new mechanics that involve unique features such as accurate positional tracking of your head and controllers.

Also, try to be unique if you want your game to sell well. We built *Space Pirate Trainer* because there was nothing like it out there.

If you're looking to implement new mechanics, either implement them in a way that people would assume it would work in real-life, or do the complete opposite.

Do some playtests as early as possible with people that are not too experienced with VR, because – like it or not – that will be a significant part of your target audience in the upcoming year. ■

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A LABOUR OF GLOVES

If VR is to be truly mass market, then the technology needs to be wildly accessible. That, some say, is where VR gloves come in

Virtual reality has a habit of fooling its users. Even those with extensive time spent in VR still find themselves reaching out to touch an object, regardless of whether they're using hand-tracking controllers. Most people could probably admit to mixing up physical and virtual reality when strapped into a HMD. It boils down to a weakness in VR's greatest strength – immersion. When your mind believes you really are in a virtual space, it is easy to assume you should be able to interact with that reality as if it were physical. When you process the experience, the brain realises you can look over your shoulder to see behind you. Instinct assumes you should be able to grasp the world around you with your hands. Cue the moment of the illusion break and the realisiation that VR can disappoint.

> **Both NASA and your average gamer have access to the same technology.**
> *Bob Vlemmix, Manus VR*

VR suffers from the inability to phsycially interact with objects

The likes of Oculus' Touch devices, PlayStation's Move wands and SteamVR's controllers do a great deal to counter those problems, lending significant new levels of immersion to VR experiences. But there is a school of thought that says we should go a stage further, and embrace haptic and gesture input gloves as a means to let players connect more completely. Outfits like Manus VR and Dexta Robotics are pioneering glove controllers that either let you use detailed hand and finger movements to interact with the world around you, or offer physical feedback in order to describe shapes and forms.

CASUAL STRIKES BACK

While the word 'casual' has fallen out of favour with the games industry, for VR to truly meet the expectations placed on it the form will have to be vastly popular. If it is to join the ranks of smartphones, PCs and colour televisions, then the content needs – at least initially – to be absolutely accessible.

"Glove solutions are more natural compared to the controllers," offers Dexta Robotics CEO Aler Gu. His team are creating a high-end mechanical hand exoskeleton named Dexmo, that lets users 'feel' virtual objects. "The learning curve for a user to pick up a pair of force feedback gloves is amazingly low. As a user, you can use your hands in VR just like you would in real life. Dexmo offers shape, size and stiffness simulation, which greatly adds up the immersion, making the game content more realistic."

Over at fellow glove maker Manus VR, a different approach is being taken, motivated by the same goal. The Manus VR glove offers some haptic feedback, but it is firstly devoted to offering accurate hand and finger tracking, allowing for instinctive, nuanced control. The team has also focused on making an affordable, mechanically streamlined and even hand-washable product suitable for the most 'casual' of virtual reality gamers.

For Manus VR co-founder Bob Vlemmix, there's another important audience to serve; game developers themselves. Appropriate experiences need to be offered to help usher in mass market VR. But how do you serve VR gloves with the experiences you build?

GIVING DEVS A HAND

"It's important that developers don't approach VR with conventional game design, as virtual reality is a whole new practice," Vlemmix advises. "It brings a whole new range of interactions that give an even deeper feeling of immersion. Let's use *Five Nights at Freddy's* as an example. You're stuck in a room and have to survive the night. During the night the animatronics move towards your room and try to murder you. "It's already a very popular game and people are actually freaking out while playing it.

"If you were to play this in a conventional way using either a controller or a mouse and keyboard, these games would still be intense, but different. The goal of VR is to simulate actual reality as best as

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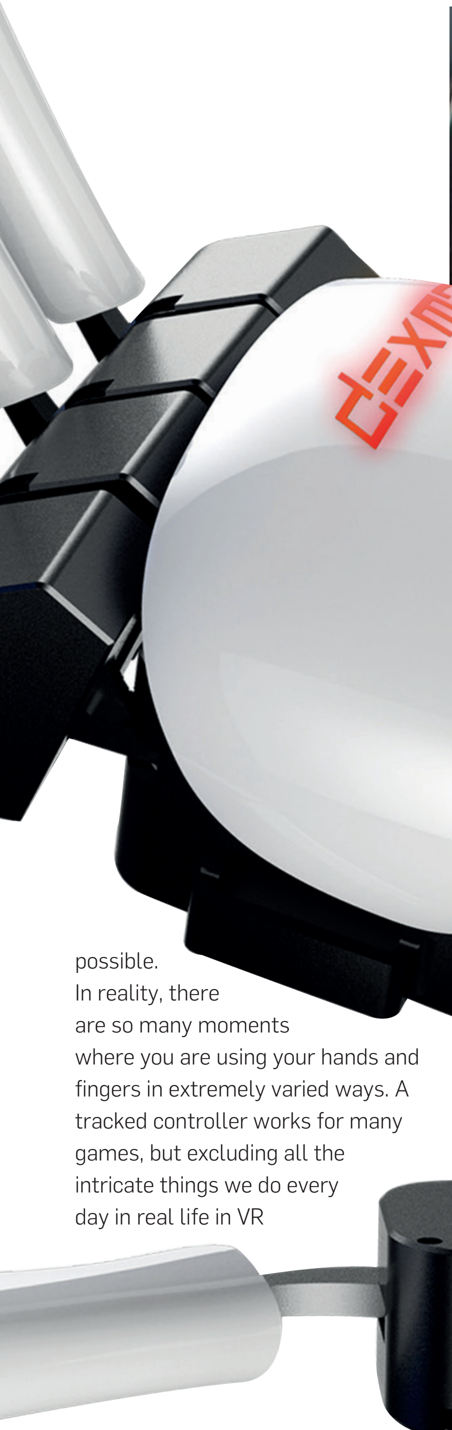
VR Gloves with haptic feedback could add more to virtual reality



possible. In reality, there are so many moments where you are using your hands and fingers in extremely varied ways. A tracked controller works for many games, but excluding all the intricate things we do every day in real life in VR experiences would be a loss."

Understanding how to best serve developers looking to support VR gloves has ultimately lead Manus VR to partner with a game team named Pillow's Willow VR Studios, which takes its moniker from its current project, the 'dollhouse scale' puzzle adventure *Pillow's Willow*.

"VR gloves fit seamlessly into the concept of what we call 'dollhouse perspective'," says the studio's CCO Peter Kortenhoeven, who came up with the game concept before teaming up with Manus VR. "Imagine an actual dollhouse, figuring out all secrets chambers that you can unfold. It's an immersive experience that seems to work because of its scale."

As several other VR demos have proved, small-scale worlds in VR can be particularly enchanting. It is that trait, Kortenhoeven proposes, that offers a perfect example of how VR gloves can add to the experience.

"Instead of the dollhouse being in front of you, it can fully surround the player," he suggests. "Add a lot of gameplay, liveliness and a bit of tension, and a great game will appear. To maintain the sense of a dollhouse, a pair of hands will show up in our game. That's where the VR gloves come in. People instantly forget they're in VR and start to grab, shift, push and replace objects and creatures. The entire game is at an arm's length distance, so you're able to look at every detail, and feel free to check whatever object or creature does when being touched."

Pillow's Willow certainly offers a captivating case study for what gloves can bring to VR experiences. But after all developers have had to learn to work with VR already, it is reasonable to reserve caution about embracing yet another technology? Offerings like that from Manus VR still let users' hands pass through the environment and objects within a games VR realm.

"We decided to give hands a 'ghost' like appearance, which perfectly fits into [*Pillow's Willow's*] fairytale-like atmosphere," Kortenhoeven says of besting that challenge. "This explained why your hands were able to intersect objects. By giving objects the same magical glow, players understand the object can be manipulated."

MECHANISM FOR CHANGE

The other option, of course, is to adopt the approach taken by Dexta Robotics, where physical mechanisms limit hand movements to simulate contact with virtual objects, employing the company's 'grasping algorithm'.

But some users may shy away from a glove controller that limits hand movements, and questions remain about the retail price when high-end systems like the Dexmo reach the consumer market. Yet Gu is confident haptic gloves like his have every chance of thriving.

"VR gaming is a rather new area, and the sunk cost is insignificant," he asserts. "And because platforms like Oculus are already educating their developers to design with the use of hands, I believe [it] won't be a big challenge in the future."

Over at Manus VR, the idea that VR gloves may struggle to hit high enough market penetration highlights another perspective; that the hardware's potential beyond games means they have a good chance of reaching that critical mass.

"Just a few years ago, data-gloves were a commodity only available to big institutions," Vlemmix states. "Our mission is to make a data-glove available for everyone. We've created a market where both NASA and your average gamer have access to the same cutting edge technology. Each day we receive more requests of studios who wish to work with our development kit and share their amazing ideas for VR. Because of that I truly believe we have something great for the audience."

It's a positive endnote from a company with a clear interest making VR gloves a success. Whether they will remains something of a mystery, but one thing is clear; the VR glove – whether as feedback device or input hardware – has potential to help evolve VR from tech devotee's to truly mass market technology. With the benefits that would bring all involved in VR, the humble glove is well worth paying attention to. ■

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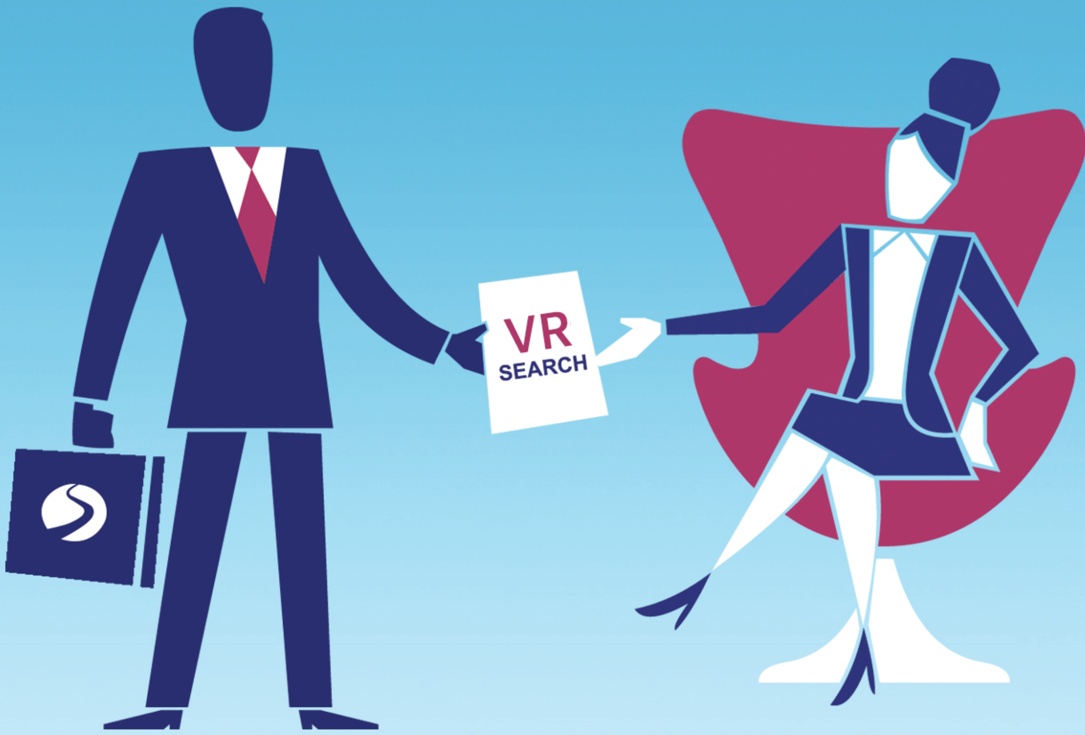

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HEARD ABOUT

MADDEN NFL 17

John Broomhall discusses audio touchdown with Solid Audioworks' Will Morton and Craig Conner

When EA director of presentation Brian Murray decided to give *Madden* an audio facelift, he turned to Solid Audioworks, formed by ex-Rockstar Games' sound hounds Will Morton and Craig Conner. The duo grabbed the ball and tore up the field.

"We were so excited to work on a sports game," Conner recalls. "Meeting Brian and audio director Aaron Janzen, as well as the whole team at EA Tiburon, was a real eye-opener. Their obsession and love for *Madden* was insane. We admired that. They had a clear vision for audio, wanting to inject a completely new energy – that certainly got our attention."

Morton adds: "American Football is unique, an intriguing balance of strategy and physicality. Live games are spectacular and mind-blowingly exciting. We desperately wanted to capture that feeling even better: all the excitement of a Super Bowl Broadcast, yet also bringing the player closer to the action – a balanced soundscape to give gamers the best of both approaches."

In order to accurately represent the very particular sound of NFL's pitches and body armour, the team hired the foley experts at Pinewood Studios.

"EA sent us several NFL kits including pads, helmets, armour, gloves, and so on," says Conner. "When we'd finished recording, it was shredded, really messed up... then EA asked us to return the kit for art reference... oops!

"For the sounds of players falling, we slammed leather and cloth bags full of NFL gear and household items onto turf, mimicking bodies hitting the ground and limbs flailing. We multi-mic'd, including one mic buried beneath the turf to capture super low frequencies and achieve some 'weight' right there at source."

Morton continues: "It came together beautifully. When we edited the source material and got it hooked-up in-game, we immediately felt we were bringing the gamer closer to the action. Many sounds were put onto tape and processed through hardware, using a real desk's EQ. We wanted to avoid an overly digital sound. We wanted something special and exciting whilst keeping the subtle detail – natural rather than OTT 'Hollywood'."

BRINGING IN A NEW MIX

A whole article could be written on commentary creation alone, which entailed a complete revamp and the construction of a new studio in Orlando specifically for it. Plus new layers of relatively close crowd reactions were created to embellish the existing crowd system, further reflecting the overall audio manifesto. But the final piece of the puzzle was always going to be the mix.

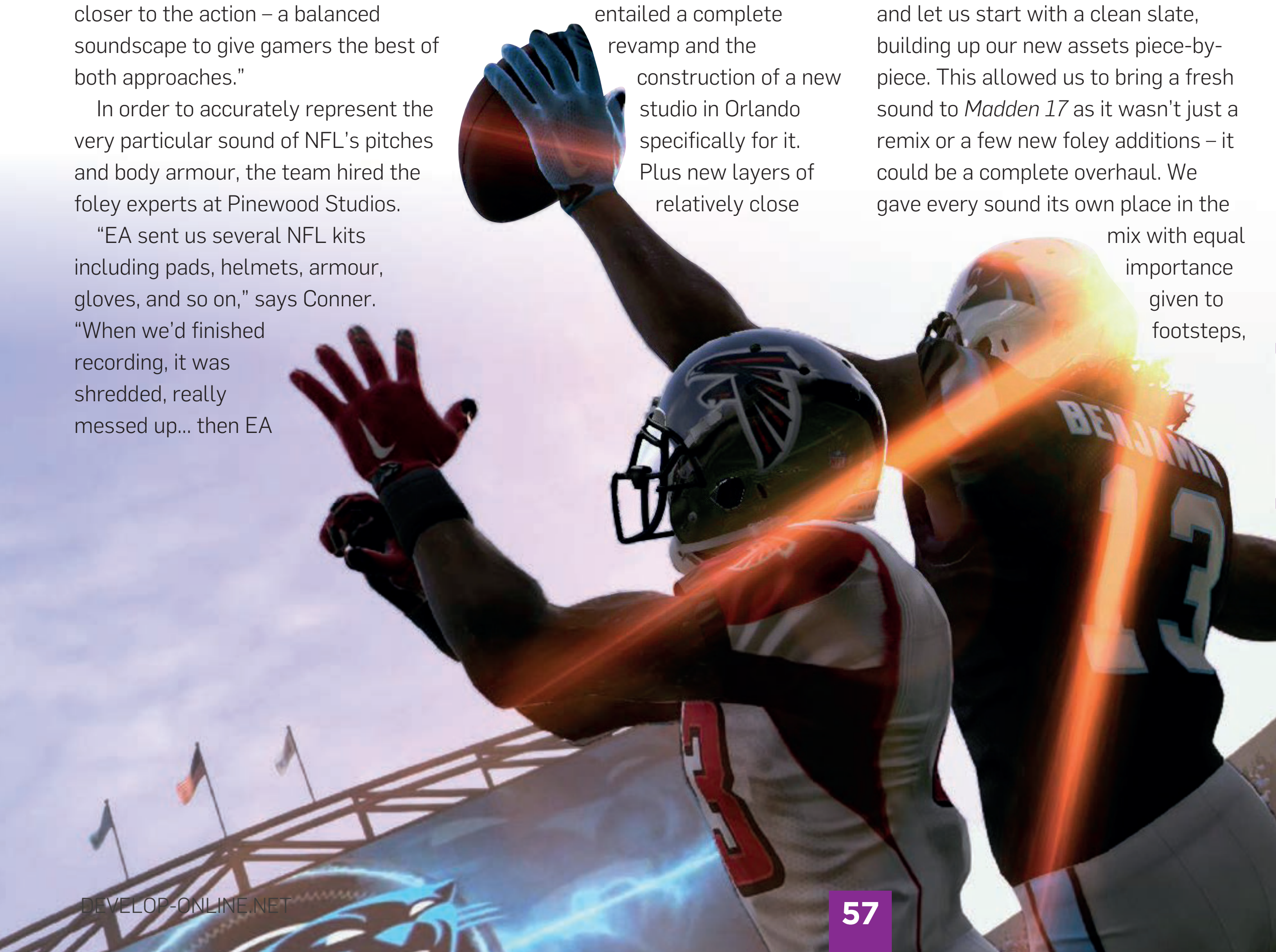
The Solid Audioworks team bashing heads together to create new sounds.

"The *Madden 16* mix sounded great but there was a lot going on, and content was getting lost," he explains. "Aaron was really open to our ideas and let us start with a clean slate, building up our new assets piece-by-piece. This allowed us to bring a fresh sound to *Madden 17* as it wasn't just a remix or a few new foley additions – it could be a complete overhaul. We gave every sound its own place in the mix with equal importance given to footsteps, commentary, crowds, players helmets smashing together and so on."

Morton adds: "Doing a stadium mix was new territory for us. We decided to treat it the same way as a song. The commentary was the singer always in the forefront, the crowds were the rhythm/acoustic guitar filling in the stereo field and foley was the rhythm section and bass. It was really that simple. This enabled us to 'kind of' assign each sound to its own frequency during the final mix."

Conner concludes: "Working with Aaron and his team on such a prestigious title was an amazing experience. We all had mutual respect for each other's work and I think the end result demonstrates that." ■

John Broomhall is a game audio specialist creating and directing music, sound and dialogue
www.johnbroomhall.co.uk



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ASK AMIQUS

Liz Prince, business manager at recruitment specialist Amiqus, helps solve some of the trickier problems job seekers currently face in the games industry

Q Dear Amiqus, virtual reality is a hotly discussed topic in the development world, but is it worth taking the risk and specialising in this area? Will it limit my future career prospects?

The games industry has always championed emerging technology and virtual reality is no exception. VR and games seem set to have a long future together. So is now the right time to specialise?

As with any new technology, at the start the demand for skills can outstrip supply so candidates with the latest skills can enjoy a choice of employers who want them. In the short term, early adopters can steal a march on the first few rounds of hiring while the market catches up.

However, it's worth bearing in mind that this can't last forever and decisions on whether to specialise should ideally be made away from any media hype. It is always important to keep your skills up to date. In many ways, if VR is going to become as big as expected, then you might want to be open to experience in this area.

The good news is that the core VR codebase is built on object-oriented programming and the most in-demand areas such as C+, C# and Unity are already very familiar. On the art side, there is demand for assets and environments created using Physics-Based-Rendering (PBR) and again these skills are fully transferable.

VR is still in its infancy and we don't yet know which types of games will utilise it most, or just how far it will shake up the worlds of midcore or casual games. On one hand we are seeing established console or mobile developers taking first steps toward VR, and on the other we are seeing VR-only studios aiming for rich AAA titles. People strongly motivated by the type of project they work on might want to wait and see where VR fits most before committing to it as a specialism – only time will tell. At this early stage, moving in to VR isn't signing up for a lifelong specialism and it really can be another string to your bow.

If VR doesn't explode as predicted, your skills will still serve you well within the games industry.

Of course it's not just code where VR specialism comes in and projects will have unique demands across all areas of development such as art, production, quality assurance and design. Games are complex and VR considerations are likely to add to this in all areas – in fact, there has been some debate about the limitations of VR games. This includes technical capability around memory and speed, practicalities of playing at home, and also the challenge of avoiding motion sickness. If this worries you, specialising in VR tech could potentially lead you toward other industries where demand is also increasing. If this sounds like you, then be open to work on VR experiences rather than games alone. Augmented reality is also generating a lot of interest. Fields as far apart as medicine, sports, cinema and retail have been quick to see the potential and it's likely that both VR and AR will to continue to be developed for wider use in society.

If your heart and soul is in games, however, fear not. The bottom line is that most career decisions are not forever, especially in the early days of new tech. Much of the industry was built on people taking risks, so if you do go for it you'll be in good company.

Most important of all is to do what you love, and pick the career you feel most passionate about. If for you this is VR then now's a good time to weigh up your options and head off for your next challenge. ■

Liz Prince, business manager at recruitment specialist Amiqus, helps solve some of the trickier problems job seekers currently face in the games industry

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